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We are quite sure that the readers of the Journal on this side of the Atlantic will welcome the addition of Professor Williams to the Editorial Staff of the VETERINARY JOURNAL. Born in 1856, he spent the early years of his life upon a large stock farm, where he acquired a thorough knowledge of the habits of animals, and through which he became imbued with the desire to follow up a veterinary training. Commencing as a student in the University of Illinois, in 1875, Mr. Williams eventually completed his veterinary courses at the well-known Veterinary College of Montreal, Canada, from whence he graduated, at the head of his class, in 1879. Entering into private practice shortly afterwards at Bloomington, Illinois, a well-known breeding centre in those days for all kinds of live stock, Dr. Williams soon acquired a large and lucrative practice, abandoning this only in 1891 on account of ill-health. Removing to Lafayette, Indiana, he was successful in obtaining the position of Professor of Veterinary Science in Purdue University. After holding this for two years, Professor Williams removed to Bozeman, Montana, being elected to the Chair of Veterinary Science in the Montana Agricultural College. He remained in this position until 1896, when, upon the foundation of the New York State Veterinary College at Cornell University, he was offered, and accepted, the Professorship of Surgery and Obstetrics.

In America, in all work connected with the advancement and welfare of the veterinary profession, Professor Williams holds a place second to none. His speciality is in connection with surgery, although by no means entirely confined to this branch of the veterinary art, and his services are much in request for practical demonstrations (and are always unselfishly given) before the various veterinary medical associations.

It is a witness of his popularity amongst his colleagues, that he has been made, by their selection, at various times, President respectively of the Illinois State Veterinary Medical Association (1888 to 1891), of the Indiana State Veterinary Society (1893), of the United States Veterinary Medical Association (1893), and of the New York State Veterinary Medical Society (1906.)

His contributions to current veterinary literature have been far too numerous to enumerate—a few have appeared in the VETERINARY JOURNAL, but the majority in the AMERICAN VETERINARY REVIEW or the JOURNAL OF COMPARATIVE MEDICINE AND VETERINARY ARCHIVES. Mainly of a clinical and practical nature, they have been of the greatest value to the every-day practitioner, and it may truly be said, that his unselfish practical surgical demonstrations of the more uncommon and difficult operations have encouraged many a nervous or diffident operator to fresh and successful endeavours.

Of larger works, probably the two best known are the translation from the German of Pfeiffer's "Surgical Exercises" (now out of print), and "Surgical and Obstetrical Operations," published in 1903.

Of his contributions in the future, our readers will have the opportunity of judging for themselves, and, as regards ourselves, we welcome the co-operation of our learned colleague.

Editorials.

ADDITIONS TO THE EDITORIAL STAFF.

OWING to the steady progress which the Journal has made, and the increasing circulation in the United States and the Colonies, it has been thought advisable to make certain additions to the Editorial Staff, and we are sure that we shall be expressing the wishes of our readers on both sides of the Atlantic when we say that we welcome the names of Professor W. L. Williams, of Cornell University, U.S.A., and Professor Wooldridge, of the Royal Veterinary College of Ireland. Neither need very much introduction to the members of the profession who read the English or American veterinary periodicals, but for the benefit of our *confrères* on this side of the Atlantic, we have commenced this number by a photograph and brief biography of our learned American colleague; and, by way of introduction to our American readers, we may say that Professor Wooldridge, although one of our youngest teachers, has for some years enjoyed the confidence of his British colleagues, and has made for himself a far-reaching reputation for sterling and solid work amongst members of the

veterinary and agricultural world. His career as a student in the Royal Veterinary College, London, was a brilliant one, sufficient to guide him successfully into the respectively successive positions of Tutor there, of Professor of Veterinary Science in the Royal Agricultural College at Cirencester, and finally to the position which he now occupies at Dublin of Professor of Medicine in the Royal Veterinary College of Ireland.

It has for some time been in the minds of those connected with this, the oldest of the Veterinary periodicals which presents its views before the English-speaking races, to endeavour to obtain an international interchange of ideas on subjects which will be of mutual benefit; and we feel sure that, in making this departure from the beaten path, the advantages which will accrue will be not only to ourselves, but to the animals whose lives we are endeavouring to protect.

SUGGESTIONS FOR IMPROVING OUR PRESENT METHOD OF EXAMINATION.

THE interest which we have endeavoured to arouse in the above subject is not now confined to our columns, as attention has been drawn to the subject by another of our veterinary periodicals, and the subject has been given a prominent position in at least one of the opening addresses which are always delivered at this season of the year in the veterinary schools. When men with the experience of Professor Woodruff (who alluded to the imperfection of the present examination system in his address at the opening ceremony of the Royal Veterinary College, London) and Professor Bradley (who pertinently brings the subject forward in our columns this month), think that the matter is of sufficient importance to require thorough ventilation, the time has surely arrived for the Council of the Royal College to seriously consider the matter. Even practitioners (as shown in our correspondence column) are aware of a desire to improve our present system, and it is certain that when the time arrives for the granting of a new Charter, this point will be one of the most important to receive consideration.

There can be no doubt that the best way to promote *steady* work (and unquestionably this is the word which is the *best* for the student) is to take into consideration the result of the College monthly class examinations, in addition to the one held by order of the Royal College Council at the end of each session.

Let the markings of the two be classified together, and it will be impossible for the lazy student to "fluke" through, and thus eventually occupy as good a position at the finish as his more deserving, plodding, and more conscientious *confrère*.

EDUCATION AND EXAMINATIONS.

BY O. CHARNOCK BRADLEY, M.B., D.SC., M.R.C.V.S., ROYAL VETERINARY COLLEGE, EDINBURGH.

Of such importance is the discussion now proceeding in the pages of this Journal, that it behoves all who feel any interest whatever in veterinary education and examinations to give publicity to their views. The comparative scarcity of communications on the subject is possibly due to the fact that both practitioners and teachers feel a disinclination to say anything which might be construed as a personal criticism of the members of the present Board of Examiners. All teachers, I imagine, count members of the Board among their friends. For myself, some of our examiners rank among my dearest friends. Criticism of the existing constitution of the Board, and of the present methods of examination, is therefore a matter of considerable delicacy. Personal feelings, however, must be set aside when a subject of such gravity, as affecting the welfare of the profession, is under discussion; and a free expression of opinion should be indulged in, in the trust that honesty of purpose may be held to be the true motive of the critic.

It may give comfort to remember, moreover, that dissatisfaction regarding existing methods of examination is not confined to any one profession, but is felt by all who have the interest of true education at heart. Reforms are being suggested and carried into effect in examinations not so open to criticism as are those which guard the entrance to the veterinary profession. In this connection I should like to call attention to a recent short paper from the pen of Professor W. D. Halliburton, which, though directed against certain medical examinations, is of great interest to the veterinary educationist.* Seeing that the article appears in a periodical not likely to meet the eye of the majority of the veterinary profession, I may be permitted to quote somewhat freely from it.

Professor Halliburton starts out by considering the ideal candidate and the ideal examiner. The former "is one who knows his work, who is able to reproduce it in readable English in a written paper, who is neat and exact in his practical work, who is ready with his answers in the oral, and who is untroubled either by conceited self-assurance or by want of confidence or nervousness." Of greater interest, perhaps, is the description of the ideal examiner. "The ideal examiner is kind and courteous; he is able to remember that not many years back he was himself a pupil, and that his main object is to discover what the students know, and not what they happen to have forgotten. If he is a teacher, as he ought to be, he will have experienced those strange lapses of memory in the midst of a lecture which are so difficult to explain, but which in a candidate are visited so harshly by the inexperienced examiner. The more one examines the more lenient one becomes. Perhaps the most difficult part in the realisation of the ideal examiner is to obtain one with sufficient experience. For to become experienced one has to pass through the stage of inexperience, and the unfortunate people he has to practise upon remind one of the

* "Ideal Examinations," *The Broad Way, or Westminster Hospital Gazette*, August, 1906.

broken test tubes the youthful chemist turns out in his learning days. It is the young examiner who bubbles over with his learning, who sets questions out of small print, who devises puzzles instead of questions, and who heckles instead of examining."

Although a student may work with diligence for months, and obtain a real insight into the subject he has studied, this may count for naught if he does not go through his paces properly on an appointed day. "All sorts of accidents may happen, and any of them may lead to disaster. Such accidents would be counteracted if the work of the previous months were allowed to count; if his note-books and sketch-books were presented; if his record of diligent attendance was consulted; if his place in the more homely class examinations was considered. Failing these, I should regard it as essential that one of his examiners should be his teacher."

Since both Professor Wooldridge* and Professor Craig† have expressed doubt as to the practicability of internal examiners in veterinary examinations, it is of considerable interest to hear Professor Halliburton on the same subject from the point of view of medical examinations. "The idea that the teacher must never examine his own students is one that is almost entirely confined to London, and is the direct outcome of the jealousies of the numerous schools of the metropolis. *This suspicious attitude towards teachers is found in no other examining boards or universities in the country, or in any other country,*‡ and even in the University of London it is beginning to die out. It, however, remains in full force at the examinations of the Royal Colleges of Surgeons and Physicians, the most conservative of all institutions.§ The teacher, knows the student's record, will be able to discount forgetfulness or nervousness, and any bias he may have to let his own man through, if it exists, is amply guarded against by an external examiner. As a matter of fact, so far as my experience goes. an examiner has very little bias in that direction, and is always severe towards real ignorance or laziness if the student is one of his own teaching."

It appears to me that the best answer to those who object to the chief reformation suggested by "Syntax" is that, in universities and schools where competition may be regarded as being as keen as it is among veterinary schools, the plan of allowing a teacher to be an examiner of his own students has been found to work satisfactorily. That this is so is, I think, clearly demonstrated by the fact that the young English universities have not hesitated to follow their elders in this respect. Birmingham, Manchester, Liverpool, Leeds and Sheffield are not so conservative that they would follow tradition were they not convinced that benefit would accrue therefrom. Even the University of London allows teachers to examine their own students in some faculties, for example, in Veterinary Science.

The veterinary profession occupies a peculiar and isolated position, inasmuch as, in terms of the Charter of 1844, a teacher cannot be an

* VETERINARY JOURNAL, June and September, 1906. † *Ibid.*, August, 1906.

‡ Professor Halliburton evidently forgets the constitution of the Board of Examiners of the Royal College of Veterinary Surgeons. The italics are not in the original.

§ To prevent possible misconception, it should be pointed out that the examiners for these Colleges are teachers; but arrangements are made by which a teacher does not examine his own students.

examiner *even of students other than his own.* So far as I am aware, no other diploma-granting body imposes such a disqualification.

In these progressive days, when suggested educational reforms are so numerous, it appears strange the veterinary teachers should commit themselves to the opinion that, under existing circumstances, the present method of examination is as good as any that can be suggested. The phrase, "under existing circumstances," apparently refers to some low sense of morals fostered in veterinary teachers as the consequence of the commercial spirit of competition existing among the various schools. Personally, I refuse to believe that veterinary teachers are so lost to a sense of what is right that they would deal out less than justice in the examination of any student. Even if, for the sake of argument, we admit that the teachers in the veterinary schools have so low a code of honour that they would be unable to withstand the temptation to pass their own students, though unworthy, surely the presence of an external examiner from another school would act as a check upon such wrong-doing.

There seems to be a fear, moreover, that if teachers were examiners the standard of examinations would become lower at some schools than at others. The same cry was raised some years ago, when it was first suggested that teachers should examine their own students for medical diplomas and degrees. In medicine the fear appeared to have some foundation, because of the multiplicity of independent diploma-granting corporations. But even in medicine those predicting disaster have been proved to be false prophets, the various examinations being more or less under the jurisdiction of the General Medical Council. Should any change occur in the constitution of the Veterinary Board of Examiners, the examinations would, naturally, remain under the strict control of the Council of the Royal College of Veterinary Surgeons, which, because of our "One Portal" system, would be in a much better position to exert such control than is the General Medical Council in regard to the very numerous and independent medical examinations.

Professor Wooldridge points out, as a justification of the present constitution of the Board of Examiners, that he and a colleague are frequently able to prophesy as to the position students will occupy in the professional pass-lists. Sight should not be lost of the fact that Professor Wooldridge is speaking of the final examination, with the subjects of which it would be indeed strange if practitioners were not thoroughly conversant. There are, however, subjects of examination which demand more attention than they can possibly receive at the hands of a busy practitioner.

Previous writers have touched upon the need for alteration in the scope and subjects of the professional examinations. "Stable Management" in particular has come in for criticism. There can scarcely be two opinions as to the unfairness of the present arrangement. "Stable Management" at the present time has just as much power to produce the rejection of a student in his second professional examination as has either physiology or anatomy! Contrast the amount of class work necessary in the three subjects, and the absurdity is manifest.

Much might be said of the existing concentration of examinations. As quoted above, Professor Halliburton is one of those who consider

that the work done during the whole session should be taken into account. Principal Dewar* has recently expressed himself to the same effect. A strong point in support of this plan of diffusion of the examination is the possibility of ensuring a greater amount of practical work. In no profession is more said of the importance of being a "practical man," but veterinary examinations are not conspicuous for the amount of practical work which they include. In many subjects it would be a distinct gain if fewer *viva voce* questions were asked, and the student required to *do* something, instead of merely talking about it. To be able to perform a simple chemical analysis, or to dissect and draw the parts of a flower, or to estimate the amount of urea in a sample of urine, is of much greater importance than to be able to describe in words how these things should be done. All teachers have known men who could pass a very creditable examination so long as they were asked questions answerable from the text-book. Give such men something to do, however, and the result is not necessarily the same. It is not a very rare occurrence to find a student in my fortnightly practical examinations in anatomy who prefers *not* to look at his dissected part when asked a question. He prefers to try and remember what his dissection manual says on the matter. Such a student ought to do badly in his professional examination; generally, however, he does somewhat better than the man who has chosen to study the book of Nature more closely than the printed page. From my own experience, therefore, I should say that, in some subjects at any rate, the professional examinations are not sufficiently practical, and to make them more so would, I think, be decidedly profitable. It would in some measure destroy the applicability to the veterinary student of a word-picture drawn some years ago by George Gissing.† At the present moment Gissing's description fits many veterinary students fairly accurately:—

"He talked only of the 'exam.,' of his chances in this or that 'paper,' of the likelihood that this or the other question would be 'set.' His brain was becoming a mere receptacle for dates and definitions, vocabularies and rules syntactic, for thrice-boiled essence of history, ragged scraps of science, quotations at fifth hand, and all the heterogeneous rubbish of a 'crammer's' shop. When away from his books, he carried scraps of paper, with jottings to be committed to memory. Beside his plate at meals lay formulæ and tabulations. He went to bed with a manual and got up with a compendium."

I have endeavoured in the above to convey a candid expression of honest opinion, because to do so is, I believe, the duty of all who have an interest in veterinary education. It seems a pity that the veterinary profession should continue to follow educational methods admittedly obsolete. The pity is all the greater since, during the past twenty years, in many directions the profession, in spite of, or perhaps because of, its youth, has made such enormous advances. It appears possible that free discussion may produce a change in methods educational.

* *Veterinary Record*, August 18, 1906, p. 105.

† "In the Year of Jubilee." In the above quotation the gender of the personal pronoun has been altered to fit the present case.

NOTES ON VARIATION OF THE HORSE'S CARPAL BONES.

BY O. CHARNOCK BRADLEY, M.B., D.SC., M.R.C.V.S., ROYAL VETERINARY COLLEGE, EDINBURGH.

No one examining a collection of bones can fail to be struck with the differences, some trifling, others conspicuous, which exist among specimens of the same bone. A recognition of such differences is of moment to the descriptive anatomist, inasmuch as he is concerned in the determination of a typical description. It is also of interest to the modern student of variation; and, furthermore, may possibly not be without importance to the morphologist seeking for evidence of phylogeny.

The individual bones of the carpus and tarsus form no exception to the rule that all bones are subject to variation, and in no part of the skeleton are variations more readily detected. The present communication embodies the results of observations upon the carpal bones of the horse, and will be purely descriptive; the consideration of the significance of the variations being, of necessity, deferred.

The material examined consists of the miscellaneous collection of carpal bones which has accumulated in the Anatomy Department of the Royal Veterinary College, and certain complete sets of bones which have been specially prepared. The miscellaneous specimens, from the nature of the process of their accumulation, cannot possibly be sorted out into either complete or incomplete sets. The specially prepared bones consist of the carpuses (both right and left) of twenty-four horses, three complete carpuses from the right limb, and one carpus from the left. The complete tale of bones is indicated in the following table. Seeing that, with few exceptions, the right and left bones of the same animal are alike, the two bones from a pair of carpuses have been counted as one:—

	Miscellaneous	Pairs of Carpuses	Single Carpuses	Total
Scaphoid	37	24	4	65
Lunar	38	24	4	66
Cuneiform	21	24	4	49
Pisiform	34	24	4	62
Trapezoid	19	24	4	47
Magnum	65	24	4	93
Unciform	24	24	4	52

The variations observable in carpal bones are those of number, character of articular surfaces, and relative size. The question of size has not been entered upon; therefore, in the present contribution, consideration will be confined to the number of bones and the form of their articular surfaces.

Obviously, variations in number are either in the direction of increase or decrease. It may be at once stated that supernumerary ossicles, such as have been described by Pfitzner and others as occurring in the human carpus, have not been found. It is possible that this may be accounted for by the comparatively small number

of animals examined with the especial view of detecting such ossicles, and it can hardly be doubted that more abundant material would reveal the occasional presence of additional bones.

As is well known, a decrease in the number of carpal bones of the horse, owing to the absence of the trapezium (Os multangulum majus), is so common as to excite no wonder. The evolutionary numerical

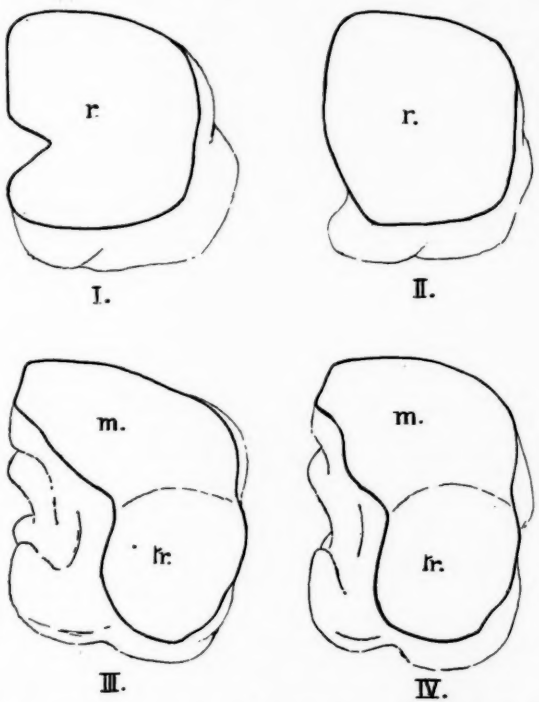

FIG. 1.—I. and II., proximal surface of the scaphoid; III. and IV., distal surface of the scaphoid; *r*, surface for articulation with the radius; *m*, surface for articulation with the magnum; *tr*, surface for articulation with the trapezoid.

reduction in the metacarpus and digits has extended to the carpus, with the result that the trapezium has become inconstant both in occurrence and size. Some time ago I made an enquiry with the object of determining the frequency of the occurrence of a trapezium, and in this place I may be permitted to recapitulate the main points by way of illustration of variations in number in the direction of decrease. The following tables are taken from the paper already published:—*

* "On the Trapezium (Os Multangulum Majus) of the Horse," *Proc. Roy. Phys. Soc. Edin*, Vol. xvi., 1905, p. 9.

Trapezium	No. of Animals	No. of Animals	Percentage	Percentage
Absent	—	14	—	48·27
Present—				
(1) Both sides	10	—	34·48	—
(2) One side only—				
(*a*) Right	4	—	13·79	—
(*b*) Left	1	—	3·44	—
		15		51·71
		29		99·98

Trapezium	No. of Carpuses	No. of Carpuses	Percentage	Percentage
Absent	—	33	—	56·89
Present—				
(*a*) Right...	14	—	24·13	—
(*b*) Left	11	—	18·96	—
		25		43·09
		58		99·98

From these tables it is evident that a trapezium is present in about 52 per cent. of horses, and in about 34 per cent. of animals it occurs on both sides of the body. If the number of carpuses be taken into account, the trapezium occurs in 43 per cent., and somewhat more frequently on the right side than on the left. But these figures apply to a trapezium whether small or large. Measurements of so small a bone were found to be both difficult and unsatisfactory. The size of the trapezium, therefore, was indicated by its cubic content as estimated by water displacement, and, in this way, was found to range from a minimum of ·1 cc. to a maximum of 1·4 cc. At the same time it was recognised that the absolute size of a small and variable bone is not of much value unless it can be referred to that of one more constant. For this reason the relative size of the trapezium was indicated by computing an index, the size of the trapezoid being taken as 100. The indices so calculated ranged from 1·20 to 16·00. So much space has been devoted to the trapezium because of its extreme interest in phylogeny.

In my comparatively small collection, the only other instance of reduction in the number of the horse's carpal bones is the consequence of the fusion of the right magnum and unciform. This is not in any way the result of pathological processes. Except for a slight and incomplete fissure on the distal surface of the bone, there is not the least indication of the line of fusion of its component parts. It may be added that the facets for the metacarpal bones are very simple.

Undoubtedly the most obvious variations in the carpal bones are those of the articular surfaces. Some bones are remarkably constant

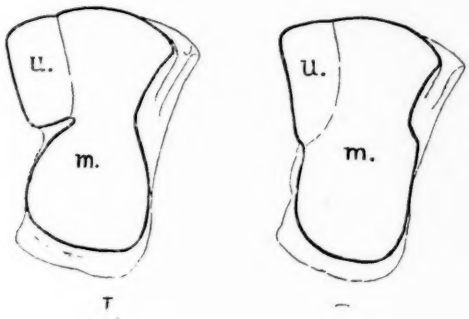

FIG. 2.—I. and II., distal surface of the lunar; *u*, surface for articulation with the unciform; *m*, surface for articulation with the magnum.

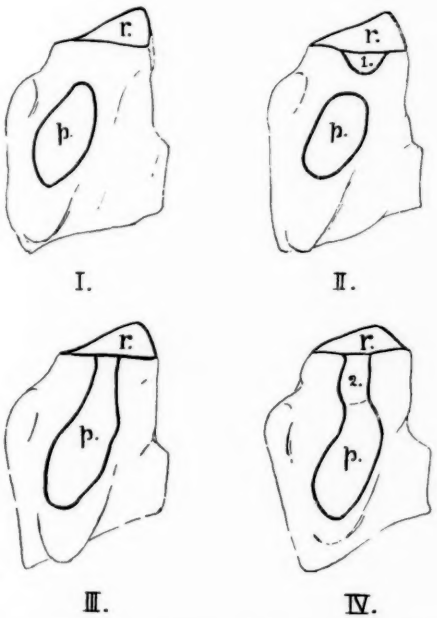

FIG. 3.—I., II., III. and IV., cuneiform bones seen from behind; *r*, surface for articulation with the radius; *p*, surface for articulation with the pisiform; 1, extra (convex) facet for the pisiform; 2, extra (concave) facet for the pisiform.

in the form of their facets, such variations as exist being very trifling, and not at all conspicuous. Others, on the contrary, have a wide range of variation, and of these, as will be seen later, the magnum forms a prominent example. The several bones will be considered *seriatim*.

Scaphoid (*Os naviculare*).—The outline of the facet for the radius is generally notched on its lateral border, but the depth of the notch is very variable. In some comparatively few specimens no trace of a notch can be detected. The range of variation in depth is illustrated in fig. I, where II. shows no notch, and I. a notch of considerable depth.

On the distal surface of the bone the amount of constriction between the areas for the trapezoid and the magnum varies, as does also the distance to which the articular surface for the magnum may project laterally beyond that for the trapezoid. Fig. 1, III. and IV., shows the range of variation. There are all gradations, and it cannot be said that any one form predominates.

The lateral surface of the scaphoid is not very remarkable. The only difference which the examination of sixty-five specimens reveals is in the antero-posterior length of the facets for the lunar.

Lunar (*Os lunatum*).—The proximal surface is always triangular, but the height of the triangle, *i.e.*, the antero-posterior diameter of the area for the radius, varies considerably in relation to the transverse diameter. Sometimes, but not very frequently, the lateral anterior angle is produced, thus reducing the relative antero-posterior diameter.

On the distal surface the size of the area for the unciform differs both relatively and absolutely, and the ridge bounding this area and that for the magnum may be either prominent or—in comparatively rare specimens—absent. A more obvious difference exists in the amount of constriction on a level with the union of the concave and convex surfaces for the magnum. Fig. 2, I. and II., shows the extremes.

What has been said of the lateral surface of the scaphoid holds good for both the medial and lateral surfaces of the lunar.

Cuneiform (*Os triquetrum*).—The only articular surface on the cuneiform which is worthy of mention is that for the pisiform. The degree of elongation of the area differs very greatly in different bones. In the majority of specimens (33 out of 49) the form of the facet is similar to that illustrated in fig. 3, I. Occasionally (2 out of 49) there is a second pisiform facet, convex in character, and contiguous with the concavity for the radius (fig. 3, II., 1). Much more frequently (in about 12 per cent. of bones) the concave pisiform facet is so much elongated that it reaches the surface for the radius (fig. 3, III.); and slightly more frequently (in 8 specimens out of 49) an articular concavity joins the customary pisiform facet to that for the radius (fig. 3, IV., 2). There are, therefore, four main types of facet for the pisiform, and the examination of forty-nine bones suggests that, given a sufficient amount of material, intermediate forms could be found. It seems fairly safe to assume that the variations just mentioned are associated with the amount of flexion possible in the radio-carpal joint; but at the present moment it is not possible to say more.

Pisiform (*Os pisiforme*).—The pisiform naturally conforms with the cuneiform; but it appears that, when there is a concave area joining

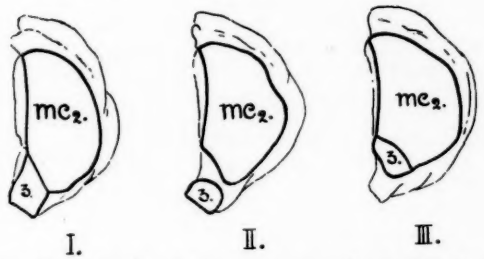

FIG. 4.—I., II., and III., distal surface of the trapezoid; *mc2*, surface for articulation with the second metacarpal bone; 3, facet for articulation with the third metacarpal bone.

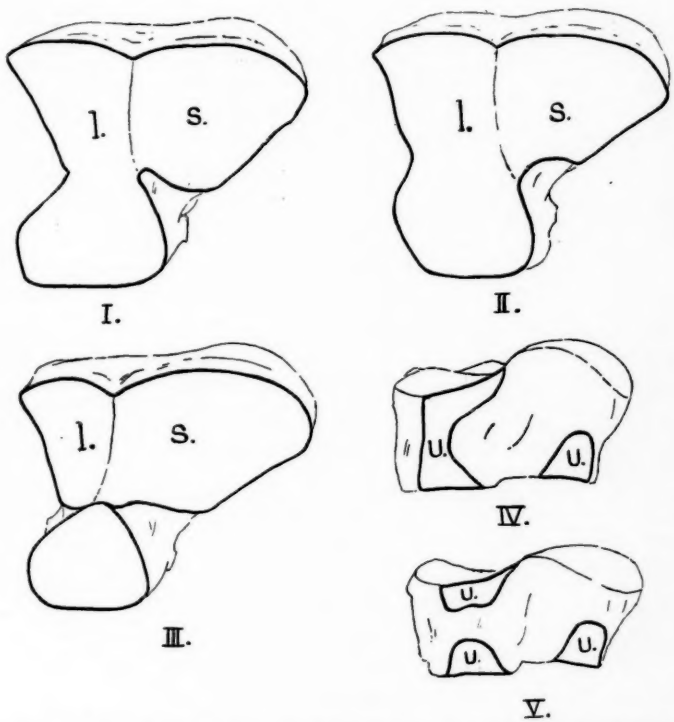

FIG. 5.—I., II., and III., proximal surface of the magnum; IV. and V., lateral surface of the magnum; *l*, surface for articulation with the lunar; *s*, surface for articulation with the scaphoid *u*, facets for articulation with the unciform.

the pisiform and radius facets of the cuneiform, the corresponding surface on the pisiform is saddle-shaped.

Trapezium (*Os multangulum majus*).—Even when the trapezium is present, it does not follow that it is articular. In the published observations, to which reference has already been made, it was found that 24 per cent. of trapezia were non-articular; 52 per cent. articulated with the trapezoid, and 24 per cent. articulated with both the trapezoid and the second metacarpal bone. Under the circumstances, it is not strange that the size of the articular area or areas, when present, should vary considerably.

Trapezoid (*Os multangulum minus*).—In about two out of every three bones there is no facet for the trapezium. When present, its level is not constant. In some specimens it is continuous with the area for the scaphoid; in others (when the trapezium articulates also with the metacarpal bone) it is placed at the lowest point of the trapezoid, or it may be intermediate in position.

On the distal surface of the trapezoid there are differences dependent upon the presence or absence, and the size, &c., of a facet for the third matacarpal bone. Its presence is, apparently, fairly constant, since out of forty-seven bones it is absent only three times. When present, it mostly (35 out of 47) joins the flattened surface which articulates with the second metacarpal bone (fig. 4, I.), but sometimes (1 out of 47) the two facets are separated by a non-articular interval (fig. 4, II.). It should be added that the two metacarpal surfaces may be in nearly the same plane, or their planes may be inclined to each other at an angle, the inclination sometimes being such as to approach a right angle—most commonly seen in those bones in which the metacarpal facets are separate.

Fig. 4, III., shows the condition of the distal surface in a single specimen. It will be observed that, though the areas for the two metacarpal bones are continuous, that for the third metacarpal does not reach the extreme angle of the bone—evidently a most unusual arrangement.

On the lateral surface of the trapezoid there are usually three areas of contact for the magnum; but in four out of forty-seven bones the posterior one is absent, a non-articular prominence indicating the position it usually occupies. Its absence does not coincide with the absence of an articular surface for the third metacarpal bone. As might be expected from its in constancy, the facet, when present, varies greatly in size.

Magnum (*Os capitatum*).—Of all the bones of the horse's carpus, none is more variable than the magnum. The triangular proximal surface is constricted, in varying degree, on a level with the confluence of the concave and convex areas for the lunar. On the medial border the constriction is produced by an indentation, wide or narrow, deep or shallow, whereas, on the lateral border, there is a convave or angular notch. Fig. 5, I. and II., illustrates the two forms, between which are all degrees of gradation. Fig. 5, III., shows a unique exaggeration of the constriction, by which the concavity and convexity for the lunar are completely isolated from each other.

On the medial surface—as on the lateral surface of the trapezoid—there may be either two or three facets, the posterior one being inconstant, as previously stated in connection with the trapezoid. The

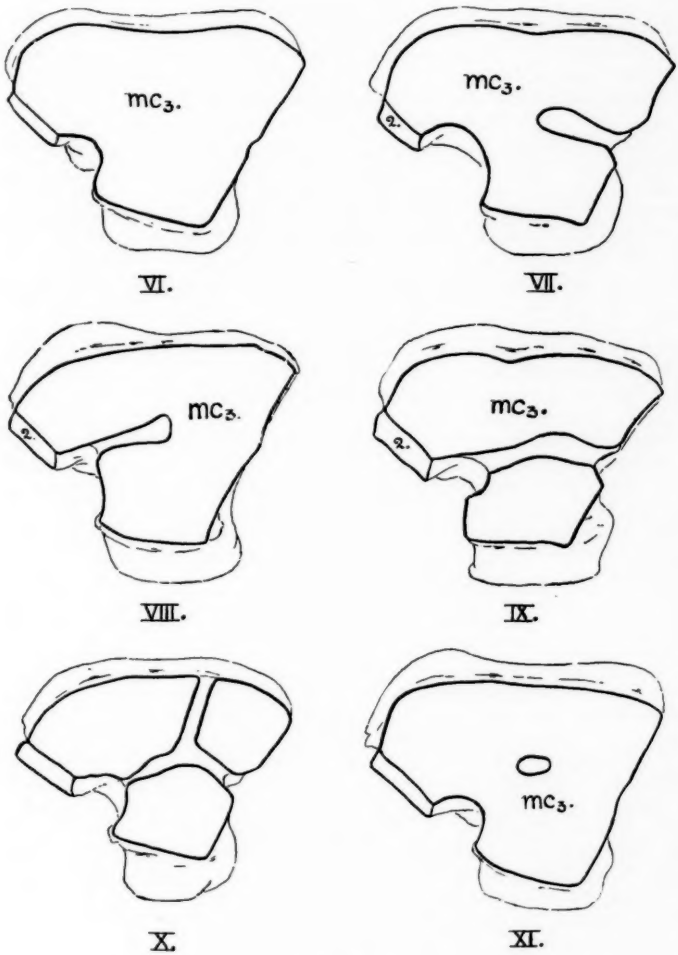

FIG. 6.

FIG. 6.—VI., VII., VIII., IX., X., and XI., distal surface of the magnum; mc_3, surface for articulation with the third metacarpal bone; 2, facet for articulation with the second metacarpal bone.

facet is absent in eight out of ninety-three bones, this giving approximately the same percentage as found to obtain for the trapezoid. In its absence a tubercle very generally takes its place. The posterior and distal anterior articular areas are separated from each other by a depression of very varying character. It may be narrow and deep, or it may be wide and shallow, or it may possess an intermediate form. This feature is correlated with a notch, consequently also variable, on the medial border of the distal surface. The two anterior facets for the trapezoid are most generally widely separated. In some rare examples, however, they are so much elongated vertically as to be almost confluent.

On the lateral surface it is convenient to consider that there are three areas for articulation with the unciform, the two anterior being most frequently continuous with each other, as shown in fig. 5, IV. In eight of the ninety-three bones, however, there is an interval—of varying width—between the two areas (fig. 5, V.). Even when there is no distinct break in the continuity of the facets, their individuality may be indicated either by a constriction or a slight ridge. The more proximal of the two anterior facets varies very greatly in the extent to which it is continued in a backward direction. In one specimen it reached well into the posterior third of the entire antero-posterior diameter of the bone.

Unlike the corresponding facet for the trapezoid, the posterior area for the unciform is always present, but its size is inconstant.

The distal surface of the magnum is of the greatest interest in point of view of variations. As illustrated in fig. 6, no fewer than six distinct types of surface for the third metacarpal bone can be readily distinguished. The two most common forms are shown in VI. and VII. In VI. the surface is simple, but in VII. a non-articular groove passes inwards from the lateral border of the bone. Of much less frequency is a complication produced by a similar groove from the medial border (fig. 6, VIII.); and still less common is a combination of the two grooves, by which the surface for the third metacarpal bone is divided transversely into two parts (fig. 6, IX.). The condition illustrated in fig. 6, XI., is fairly common. Here there is a non-articular island—very different in extent and depth in different bones—in the middle of the surface. Fig. 6, X., shows an apparently rare condition, in which the surface is divided into three parts by a tri-radiate groove.

In addition to those which can be referred to the above six definite and distinct types, there are some few bones which cannot be satisfactorily classified, since they partake of some of the characters of more than one type. It is not possible, however, to say that they form decided connecting links. The ninety-three bones which have been examined may be classified, according to the character of the distal surface, as follows: VI. = 41; VII. = 29; VIII. = 5; IX. = 3; X. = 1; XI. = 7. Seven cannot be accurately classified.

The superficial extent, and the shape of the facet for the second metacarpal bone, differ greatly, as does also the angle at which its plane meets that of the surface for the third metacarpal bone.

Unciform (*Os hamatum*).—What has already been said for the facets on the lateral surface of the magnum also applies to the medial surface of the unciform.

As is well known, on the distal surface of the unciform are three articular areas; two—either completely or incompletely separated from each other by a notch—for the third metacarpal bone, and a third—most lateral in position—for the fourth metacarpal. The last-mentioned, and the posterior facet for the third metacarpal, being inclined towards each other at an angle, are always sharply defined. But the anterior facet for the third metacarpal and that for the fourth metacarpal bone are not always easily differentiated. Generally they meet at a ridge; but sometimes there is a shallow and narrow groove between them; occasionally there is neither a groove nor a ridge.

The foregoing observations, for the present, have been directed towards the determination of the most common condition of the horse's carpal bones, and to the recognition of the direction in which variations may occur and the degree of frequency with which they take place. It remains for the variations to be explained, either from the physiological or from the phylogenetic side, or from both; but this requires much more data than are at the moment at command.

INFECTION IN TUBERCULOSIS.*

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THE question of infection in tuberculosis is one of supreme importance, not only to the veterinarian but also the breeder and raiser of stock. The side of the question relating to man we do not purpose treating just now; we desire to direct our observations especially to the means whereby tuberculosis is conveyed to the lower animals and the probable route traversed by the virus when once it has obtained access to the tissues.

Tuberculosis is, as the late Professor Walley described it, a veritable scourge, not only to the bovine race but to all the vertebrate sub-kingdom, for it is now recognised in mammals, birds, reptiles, amphibia and fishes. In mammals and birds it is exceedingly common, the disease being acquired naturally; among the lower vertebrates infection is, in most cases, doubtless accidental or designed.

Among domestic animals the sheep and goat, though susceptible, and even highly so, are not commonly victims, but bovines suffer heavily; then the pig, horse, dog, and cat. Birds—the common fowl particularly—pay a heavy toll, and semi-wild birds, as pheasants, are also frequently affected. Turkeys also suffer, and seriously; it has been no uncommon thing to receive specimens in the laboratory, taken from birds which, up to a short time before death, had been in the best of health apparently, and weighing considerably more than 20 lbs.

Tuberculosis is due to the ravages, in the tissues, of the bacillus of tuberculosis. I do not intend to discuss the unity or quality of human and bovine bacilli. I am a firm believer in the doctrine that there is only one tubercle bacillus, and that its pathogenic properties are determined by its habitat, by the tissues and fluids in which it has developed.

* A paper read before the Irish Central Veterinary Medical Association.

We know full well that in other diseases the virus may be exalted or attenuated by passage through different animals, and that it may so lose its potency that it may now be safely inoculated into animals susceptible to the action of the unattenuated virus. In a similar fashion I consider that the avian tubercle bacillus has become attenuated for the mammal; but we know even in this case that, experimentally, we may render the avian bacillus pathogenic to mammals. In the same fashion, but to a different degree, we may obtain bacilli of human origin which are no longer highly pathogenic to cattle, and doubtless the converse is equally true, but, as the German Commission has shown, there are undoubted cases of infantile tuberculosis of bovine origin; bacilli isolated from such cases being highly pathogenic to cattle. There is no doubt of this at all, and I claim that I am justified in maintaining that bovine tubercle bacilli are pathogenic to man if I can show that tuberculosis in man can be produced by the bovine bacillus. Now, every veterinary pathologist knows that bovine tubercle bacilli are pathogenic to all the domestic animals, and it would be passing strange, indeed, if man alone were exempt from its ravages.

Direct experiment is not possible, but accidents happen, and there are undoubted cases on record of skin tuberculosis in man (lupus) due to direct contamination with bovine tuberculous material. Every man does not become tuberculous in regard to his skin because he handles tuberculous material, even when his epidermis is not intact, but then, every man who handles anthrax material does not develop malignant pustule, even if his hand is wounded. What I desire to emphasise is this, that because on occasion the disease does not develop it does not follow that the virus is innocuous to that particular animal. Most of us, at some time or other, are open to tuberculous infection, but we escape infection by reason of the potent forces at work in our tissues, which protect us. Not every person or animal carrying a tuberculous lesion does, or need, die from tuberculosis. The very forces which guard us against infection protect us when we become infected. It will be seen, therefore, that I am not one to subscribe to Koch's doctrine that the bovine bacilli are not pathogenic to man, indeed, I maintain that they are, and are capable of producing lesions in man as in other animals.

Infection occurs by ingestion, by inhalation, by inoculation, and in the young animal by the blood stream. In the last case, which we will consider first, infection occurs through the umbilical blood from infection from the tuberculous uterus of the mother. This is the so-called congenital tuberculosis. The fertilised ovum develops along the normal lines, and becomes infected during intrauterine life from the tissues of the mother indirectly. It is extremely doubtful if the fœtus is infected primarily by the sire suffering from a tuberculous orchitis, although infection may occur secondarily to infection of the uterus by infected semen. It is difficult to believe that the ovum could develop if the tubercle bacilli gained access with the sperm cell at the moment of fertilisation. Infection of the fœtus undoubtedly occurs much later during intrauterine life; and, as I have mentioned, by the blood stream along the umbilical vein. Possibly the commonest route of infection in tuberculosis is by ingestion, and to this portion of our theme I wish to devote some time, and first I desire to direct your attention to the disease in the bird.

Tuberculosis of the bird is exceedingly common, and once it has gained access to a poultry run the mortality may reach 100 per cent., all the birds dying sooner or later. Tuberculosis of the bird is an abdominal tuberculosis; the lesions are in the intestine, which is often ulcerated, and in the mesenteric glands there is frequently a tuberculous peritonitis, the intestines being matted together by the products of the peritonitis. The liver is studded with lesions, the spleen is enlarged and contains numerous tuberculous foci. Sometimes, though not commonly, the kidneys and ovary are infected. A very noteworthy fact is the rarity of the lesion in the lung; I have seen it in the turkey.

The distribution of tuberculous lesions in the fowl point out that infection has occurred through the alimentary tract, and that the infective agent has been brought in along with the food. The condition of the alimentary tract and the nature of the dejections which are being scattered over the poultry run by diseased fowls accounts for the spread of the disease. The food being constantly picked up by the fowls is soiled with droppings swarming with tubercle bacilli. Moreover, there is a tuberculous lesion of the feet of fowls known as "bumble-foot," a lesion marked by an enlargement on the plantar aspect of the foot. This lesion often breaks down and gives exit to myriads of bacilli. Such a case came into the clinic some little time ago; a smear made from the purulent material oozing from a fissure in the swelling showed tubercle bacilli in inconceivable numbers. I have little doubt in my own mind that this fowl was spreading tubercle bacilli and tuberculous disease broadcast among the other fowls of the run.

A further interesting and very probable source of tubercle is the consumption of maggots. Some time ago a tuberculous liver of a fowl came to the laboratory, and after diagnosis was put aside upon a tray. It was summer, and soon it become fly-blown and crawling with maggots. I allowed the maggots to develop for a time and then killed and fixed them, passed them through paraffin and cut sections. After staining I had no difficulty in finding large numbers of tubercle bacilli in the maggots. (Since this was written I have allowed maggots taken from a tuberculous lymph gland to develop, and have found tubercle bacilli in the flies issuing from the maggots.)

In fowls, therefore, we may claim that tuberculosis arises through the ingestion of food contaminated with the tuberculous virus, and that tuberculosis probably never arises through inhalation.

Tuberculosis in the Dog and Cat. — Tuberculosis in the domestic carnivora has an important bearing upon the question of tuberculosis in man. My own experience in tuberculosis of dog and cat is that it is of intestinal origin. The cases I have seen in the dog have had marked abdominal lesions, particularly of the liver and kidney. In one case there was a true tuberculous eruption upon the serous membrane, the serous covering of the stomach being very much involved. The liver, as a rule, contains large caseous masses, and I am inclined to think that many cases of tuberculosis are, on *post-mortem* examination, at first taken to be growths of a malignant nature.

In a case I had in the cat the predominant symptoms and lesions were located in the chest, the thorax being filled with fluid in which tubercle bacilli were found in great abundance. There were cavities

in the lung, and the animal had coughed for some time prior to death. The only lesion I could find in the abdominal viscera, with the exception of the kidneys, was a tuberculosis of the mesenteric gland in connection with the cæcum; it had broken down, and contained numerous tubercle bacilli. I believe this lesion to be older than that of the lungs, and to be the primary centre of infection. The kidneys were cirrhotic.

Tuberculosis of the Pig.—In the pig infection occurs probably in all cases through the alimentary tract. The habits of the animal, his omnivorous taste, the custom of giving refuse and offal of all kinds, all conduce to infection of some kind or other. Trichinosis is common in some countries, in others measly pork is readily met with, in all tuberculosis is far from infrequent, and the portal is by way of the alimentary tract.

The disease in this animal is very prone to generalisation, and for this reason lesions of tuberculosis in the pig must be viewed with grave suspicion. Further, serious lesions may be found and still the animal be in a good bodily condition and of prime quality. I remember seeing the carcase of a pig in splendid condition to all appearances, and yet the centre of the vertebræ contained caseous tuberculous centres. Tuberculosis of the spleen and liver are very common, the condition of the spleen being comparable to that seen in the horse. I have a specimen from the pig into which it would be impossible to place another tubercle the size of a pin's head without touching other tuberculous lesions. In the liver the lesions are often numerous and yet discrete, but sometimes we find that the organ is the seat of a miliary tuberculosis, the lesions being microscopic in size. In the lungs the tuberculous centre may be of the chronic nodular type, the lesion a chronic broncho-pneumonia, but very often the lungs are filled with miliary tubercles, exceedingly numerous, pale yellow in colour, six weeks to two months old. The pig does not generally live longer than this after the development of the tubercles, and it is often surprising how he could have lived so long with so much pulmonary tissue destroyed.

In the pig the voluntary muscles sometimes show lesions of tuberculosis, and especially in the neighbourhood of joints. The muscles have probably been invaded from the joint along the course of the lymphatic vessels, the joint itself being involved in a tuberculous arthritis.

That the intestine is the portal for the tuberculous virus is indicated by the almost invariable tuberculous change found in the mesenteric glands, and by the not infrequent tuberculous lesions of the mucous membrane. Sometimes the lesion of the membrane is an ulcer, at other times it is a necrosis, the necrosed mucous membrane being raised up above the general level of the membrane, and persisting as a more or less irregular elevation, composed of friable tissues readily breaking down between the fingers. Below and adjacent to this necrosed tissue the tubercle bacilli may be found in immense numbers. I wish, then, to emphasise that in pigs the route of infection is by the alimentary tract, that animals in good condition, even fat, may carry serious lesions of tuberculosis, that there is a great tendency in this animal to generalisation, and hence tuberculous lesions in the pig must raise serious doubts in the mind of the inspector as

to whether he is justified in passing the carcase of such an animal for human consumption.

In the *Irish Times* for July 30, 1906, I find that "The Markets Committee of the Belfast Corporation have for some time had under consideration the question of the destruction of the carcases of pigs found to be suffering from tuberculosis, and at yesterday's meeting (July 28) it was resolved that in all well-nourished carcases where tuberculosis was confined to the glands of the neck, the head only, or such portion as was affected by the disease should be destroyed, the remainder of the carcase being returned to the owner. In the case of the disease having become generalised, however, the Committee decided that the whole of the carcase should be destroyed." I am not aware that the Belfast Corporation employ a qualified veterinary surgeon as their inspector of meat, and I think it most lamentable that such an instruction should be given to, presumably, a lay inspector, who, acting under orders, may seize "the head only, or such portion as was affected by the disease," when not only may there have been serious lesions in other parts, as the vertebral column, but even generalisation, though not necessarily evident, even to the practised eye. One cannot be too careful in the examination of carcases of swine.

Tuberculosis of the Horse.—This also is an abdominal tuberculosis primarily, and has been ascribed to the giving of cow's milk. The most striking lesions on *post-mortem* examination are the size of the mesenteric glands, the peritonitis, and the condition of the spleen. The state of the latter organ is as striking as it is characteristic. It is enlarged, and apparently filled with new growths, of sizes varying from infinity to a child's head or larger. Frequently the tumours are firm and greyish-white on section, at other times soft, fluid, and containing a material like oatmeal porridge or gruel. The material in the tuberculous lesions are enormously rich in bacilli, in this respect resembling the lesions of the bird. A smear of the pus stained in the usual way may be so rich in masses of bacilli that even after completion of the differentiating process the film is red. Lesions occur in the other abdominal viscera, but they are not so characteristic as those observed in the spleen.

In the lungs the lesions are not always of the same type. Sometimes the lungs appear to contain numerous new formations like to neoplasms—to sarcomata—for which, doubtless, sometimes they have been taken. At other times the pulmonary lesions are of a diffused broncho-pneumonic type, with large necrosed areas undergoing caseation, the appearance on section being like to brown. Again, the lesion may be of the miliary type, the lungs being filled with innumerable minute lesions the size of a pin's head. In my experience these three types are the commonest forms of tuberculosis in the lungs of equines.

There is no likelihood of any one form being taken for the glanders tubercle, which is practically an abscess surrounded by an intense hæmorrhagic zone. The glanders tubercles are few in number, generally, and are irregularly scattered through the lung, and indifferently in both lungs. Nor is there any chance of the lesions of tubercle being mistaken for the worm nodules found in the horse's lung; these are hard, enclosed in a fibrous capsule, and can be torn from the lung parenchyma only with difficulty.

Tubercular lesions in the bones of the vertebral column are not unknown, and also of the submaxillary, post-pharyngeal and pre-pectoral lymph glands. I have a record of a case of tuberculosis of the horse, which I believe I have mentioned already, but which will certainly bear repetition. The animal was a cart-horse, weighing seventeen hundredweight, and apparently, save for a swelling in the intermaxillary region, in splendid condition. It was at first thought that the animal was developing strangles, but the glands never suppurated. An incision made into the glands was only followed by blood. The animal did not cough save when feeding; the appetite remained good. Portions of the tumefaction in the intermaxillary region were incised and examined, but nothing definite was found. It was believed by the practitioners in attendance that the animal had a new growth, a malignant tumour, and the animal was destroyed. Unfortunately, I did not have the opportunity of a *post-mortem* examination, and I could not ascertain the condition of the contents of the abdomen. The submaxillary, post-pharyngeal, prepectoral lymphatic glands, and portions of the lungs were sent to me. The lesions in the lungs were discrete tumour-like formations, and contained myriads of tubercle bacilli. Tubercle bacilli were found in all the glands examined. Unfortunately, the *post-mortem* record is incomplete, and we know nothing of the condition of the viscera behind the diaphragm, but the lesions noted are precisely those of a tubercular infection occurring through the mouth in the neighbourhood of the head and traversing the lymph tract to the thorax. The animal was only 4 years old, and never lost condition.

On the other hand, loss of condition may be very pronounced. The course of the disease is slow, insidious, and often puzzling. If there are not well-marked symptoms, but constant and progressive loss of condition, I would advise the use of tuberculin as a diagnostic agent.

It is often extremely difficult to trace the source of infection, but I think, in view of all the work done recently in tuberculosis, we are justified in affirming our long-maintained conviction that infection has occurred by the alimentary route. Practitioners would do well when recommending the use of milk as a sick diet to insist that the milk be boiled, or at least pasteurised, and if cow's milk be given to young equines, as it often is, that it be given only after sterilisation.

Tuberculosis in the Bovine.—Of all the domestic animals the bovine is most commonly affected with tuberculosis, particularly aged dairy cows. In young animals running out in a state of Nature infection is rare, or, at least, the lesions are minute, and may be "closed." "Closed" lesions are those which have undergone degenerative changes; they are no longer dangerous to other animals, and may be healed and not likely to extend. Sometimes these "closed" lesions may contain virulent material, as found on inoculation, and occasionally they may break down and be the source of a secondary infection. It is the "open" lesion discharging virulent material which is such a frequent cause of the spread of the disease, not only in the individual but also to others. If the lesion is in the lung then the virus is spread, it is said, by the fine droplets of moisture forcibly ejected from the bronchi, during paroxysms of coughing, into the air which is breathed by animals confined in the same house. Or again, and this in my opinion is more common in the ox, the virulent material coughed up to the pharynx is

swallowed, and passing along the alimentary tract produces secondary infection and a new crop of lesions.

It is very commonly noticed on examination of tuberculous lungs that there are lesions of different ages, some old, others more recent; the recent ones following a secondary infection from an old lesion. In some cases undoubtedly the recent lesions are produced by inhalation of the virus into the deeper parts of the lung supplied by the bronchus into which the broken-down lesion is discharging. Or it may be by extension along the lymphatics, and possibly by ulceration, into the blood stream. In the latter case, however, the secondary lesions are more likely to be generalised, because it is probable that the pulmonary vein will be involved, rather than the pulmonary artery.

In secondary lesions in the lungs from discharge of virus into the bronchi the resulting changes will be those of a tuberculous broncho-pneumonia with consolidation of the pulmonary tissue. It is easy to believe that such extension does occur, and there is no reason to doubt but that it is by no means uncommon. In my opinion, however, the most important secondary lesion is the one following invasion of the virus at a distance, or at a distant point, and the conveyance of the virus from the point of entry to the lung. The importance of this cannot be exaggerated in view of recent experiments of tubercular infection, not only in laboratory animals, but also in both cattle and goats.

It will be remembered that von Behring put forward the opinion that tubercular infection occurred in early life, at the time of the milk diet, and he explained the frequency of tuberculosis of intestine and mesenteric glands by the hypothesis that the intestinal lining was not completed until some time after birth. In other words, the intestine was vulnerable, much more so than during later life. It has been shown, however, that the intestine is vulnerable in later life, and that tuberculosis of the lungs will supervene upon feeding with tuberculous material, and this in adults even when the infectious material is in small amount. It was considered that the pulmonary lesions arose from the breaking down of old centres produced by early intestinal infection, and that infection from the intestine did not occur because experimentally the lesions in the mesenteric glands were trifling or apparently wanting. Now, however, it has been shown by Calmette and Guérin* that the lymphatic glands of adults are only imperfect

* Calmette and Guérin's experiments were made upon young goats sucking udders of dams that had had an experimental tuberculous mastitis induced. Bacilli of different sources were employed—bovine, human, and avian. Positive results were obtained in those cases of mastitis set up by the human and bovine bacilli, the lungs of the sucklings containing numerous tuberculous centres.

The experimenters also used adult cows. The animals were recognised as free from tuberculosis by the use of tuberculin, and were then given, by aid of the stomach pump, quantities of virulent cultures of tubercle bacilli, ·10 gr., ·25 gr., ·50 gr., and 1 gr. The pump was used to ensure passage of the virus beyond the rumen and to prevent any infection of the upper part of the alimentary tract. Thirty days afterwards all reacted violently to tuberculin. There is no need to give all the results of the *post mortems* and control experiments, and I will content myself by giving the conclusions drawn from the results of the experiments:—

"That animals contract tuberculosis easily by the intestinal tract, not only when young but also in adult age, and without showing any visible lesions in the walls of the alimentary tract.

"That in young animals the bacilli are generally kept back by the mesenteric glands.

filters, and that bacilli may easily pass through glands, where they would be arrested in the young. Hence infection might readily occur through the intestine, leaving no trace either in mucous membrane or in mesenteric glands. The same may be said of glanders in the horse.

Calmette and Guérin, from their investigations, make an important recommendation, which cannot be too widely made known, and that is that consumptives should be taught to expectorate and not to swallow the products of their lungs.

Vallée caused very young calves, free from tubercle at the beginning of his experiments, to suck the udder of a cow affected with tubercular mastitis. The calves sucked twice, and each time took about 150 cc. of milk (about five fluid ounces). Afterwards the calves fed upon their mothers, free from tubercle, or took boiled milk. Thirty-five days after the commencement of the experiment they reacted markedly to tuberculin. All, when slaughtered, were found to have tuberculosis of the bronchial and mediastinal glands. The lungs were free from tubercle, but there were newly erupted lesions upon the anterior surface of the diaphragm, indicating that the virus had traversed the lymphatics of the diaphragm, from peritoneum to thorax, and thence infected the bronchial and mediastinal glands.

I myself have seen tuberculosis of the bronchial glands without discoverable pulmonary lesions, and I would ask the profession to pay particular attention to the bronchial and mediastinal glands in all young cattle which come to *post-mortem* examination. (Probably those cases of reaction, following the use of tuberculin with no discoverable lesion at *post-mortem* examination, may be explained by the fact that the lymphatic glands may contain bacilli even without histological lesions. In some cases inoculation is necessary to reveal their presence.) In order further to prove the route of the infection, Vallée performed a laparatomy, and inoculated, with all precautions, tubercle bacilli directly into a mesenteric gland. The animal was killed forty-nine days later. The gland was enormously increased in size. The neighbouring glands, the sub-lumbar glands, liver and lungs, were free from tuberculosis. The bronchial glands were three times the normal volume and contained tubercle bacilli. He concludes from his researches, that of all methods of infection that of ingestion is most rapidly followed by lesions in the glands connected with the lungs, and "that the bacilli may penetrate through the intestine without leaving any trace in either mucous membrane or mesenteric lymphatic glands, to collect and proliferate in the bronchial glands."

It will thus be seen that infection by the alimentary tract in tuberculosis is not difficult, and that lesions may be set up in lungs and in bronchial and mediastinal glands. It appears, however, that tuberculosis of the lungs is not so readily induced by inhalation experiments as is generally believed. Intratracheal injections are not more certain,

Either infection remains localised here for a greater or less length of time and ends by healing, or caseous tubercles develop and extend along the course of the lymph stream.

"That in adult animals, the lymphatic glands not offering so determined a barrier, the bacilli are more generally found in leucocytes in the lymph stream, and thence in the pulmonary artery passing to the lung.

"That so-called *primary* tuberculosis of the lung is most often of *intestinal origin.*

"That of all methods of infection that by the intestinal tract is most constant, and accords best with the usual conditions of natural infection."—*Annales de l'Inst. Past.*, May, 1906.

for, save for local lesions where the needle penetrated, the respiratory passages remained free from infection. Roux and Vallée, using a special contrivance, sprayed the nasopharynx of twelve calves, giving each several milligrammes of virulent tubercle bacilli. Of these only four showed signs of tubercular infection; three had had two sprayings, the remaining one only one. Two of the three and the fourth rapidly showed clinical evidence of tuberculosis. Calf 1 had caseation of the retro-pharyngeal lymphatic glands; all the viscera, bronchial and mediastinal glands were free from infection. No. 2 calf had tuberculosis of the retro-pharyngeal, cervical, and tracheal glands, no lesions elsewhere. No. 3 had also infection of the retro-pharyngeal lymphatic glands, which were enormous; all other viscera were free. No. 4 had tuberculosis of the retro-pharyngeal and tracheal glands, but no other lesions.

It appears, therefore, that infection of the lungs through the respiratory passages is not common, and that, at most, animals receiving a dose of virus out of all proportion to that offered under natural conditions, show infection in the upper part of the tract.

In practice there does not appear to be much doubt that infection of the retro-pharyngeal lymphatic glands occurs as the result of direct inoculation from coughed-up tuberculous material which is swallowed. That tubercle bacilli do lie in the pharyngeal mucus of consumptive cows I have satisfied myself, and tuberculous pharyngeal lymphadenitis is frequently associated with pulmonary tuberculosis. It is possible that, exceptionally, a tuberculosis may commence in the lymphatic glands about the head, and extend from the primary site along the lymphatic vessels to the chest.

In chronic tuberculosis, as in chronic nodular tuberculous bronchopneumonia, the necrotic process may involve a blood-vessel, and the walls becoming ulcerated give way and allow the contents of the nodule to enter the blood stream. This, probably, is the commonest way generalised tuberculosis comes about, the virus being conveyed by the blood stream and disseminated over the whole body. Now, it is a matter of some interest to know how soon miliary tubercles may become manifest in, say, the lung, after entrance of tubercle bacilli into the blood stream. I am able to say that miliary tubercles are in evidence on the third day in rabbits, as Borrell showed, and further, that tubercle bacilli may be found in the bronchial lymphatic glands at the same time. Further, and also in the rabbit, I have found tubercle bacilli in the spleen on the fourteenth day following injection of a culture into the auricular vein. Lesions may also be found in the kidney at this early date. In other words, bacilli may have passed through the pulmonary filter into the bronchial lymphatic glands in three days, and from these glands into the blood stream to infect other organs and the body generally in fourteen days. Of course, it is possible that some few bacilli may have passed right through the pulmonary circulation without being arrested there and have entered other organs, but I think it more likely that there has been a fresh eruption into the blood stream from either lungs, or through the lymph stream from the bronchial glands.

There is no doubt, then, that tuberculosis follows the ingestion of virulent tuberculous products both in the young and in the adult, and we may take it as proved that pulmonary tuberculosis supervenes upon

infection by the alimentary tract. This being so, then the question of prevention resolves itself into careful supervision of the food supply.

Other forms of tuberculosis, such as lupus or tuberculosis of the skin, tuberculosis of the lymphatics of the skin as seen in cattle, and doubtless cases of tuberculosis of the udder, are due to direct inoculation of the virus, the disease being primarily a local one. Possibly most cases of udder tuberculosis have a different origin, but these just now do not interest us.

From what has been said it will be understood that tuberculosis is a disease of intestinal origin, that even cases of pulmonary tuberculosis can be traced to this source, that possibly too much attention has been paid to the opinion that it is primarily through the respiratory tract that infection occurs. The history of tuberculosis is coming nearer and nearer that of glanders. It was believed that glanders was spread by inhalation of the virus; recent investigations, however, have shown that the alimentary way is the most common and the most likely. Indeed, we may take the recent history of the work on glanders as emphasising the opinions now to the forefront as to the most probable route of infection in tuberculosis. Knowing the most common route of infection, cannot we now check the ravages of this "white plague"?

Treatment of tuberculosis, save in the early stages, is far from satisfactory. In later stages we all know that the damage done is far too serious for remedial measures; we can only hope to benefit our patients in the early stages, when there is a chance of assisting in the production of fibrous changes in the lesion.

In conclusion, a few words may be said upon the question of prevention. Prevention may be accomplished along two lines: (1) Keeping the amount beyond the possibility of infection; and (2) rendering the animal immune to infection. The well-known advice of Bany, carried out in its entirety, would accomplish the former; recent researches indicate how the latter may succeed. It has been shown that if young animals free from tuberculosis receive by the alimentary tract tubercle bacilli of low potency, after a time they become capable of withstanding doses of infective material that surely kills control animals. Now, this is merely a phase of the Pasteurian method of immunisation, and has the disadvantage of being possibly dangerous for some animals. The use of living bacteria is a drawback, inasmuch as the disease may be produced which we desire to check. However, still more recently, it has been shown that dead tubercle bacilli have also the power of producing an immunity which apparently is as satisfactory as that set up by living bacilli, and without the drawbacks of the latter. More work upon the whole question is desirable, but the results are promising, and the recent publications of Calmette and Guérin, of Roux and Vallée, hold out the hope that the question of immunisation in tuberculosis is nearing solution. These researches follow upon those of von Behring, who observed that attenuated cultures of tubercle bacilli were capable of giving immunity to virulent cultures; and I believe I am correct in saying that priority may be claimed for Sir John McFadyean, who suggested the use of the avian bacillus to give immunity to bovines against the disease set up by the specific bovine bacillus. But we have no intention of discussing the claims of priority; it is a cause for congratulation that recent work indicates that we are within measurable distance of being able to confer immunity against this dread disease.

Clinical Articles.

THREE CASES OF INTERDIGITAL CYST IN THE DOG, CAUSED BY THE AWNS OF WILD BARLEY GRASS (*HORDEUM MURINUM*).

BY W. F. GARSIDE, M.R.C.V.S., REIGATE.

In the dog it is by no means uncommon for a cyst-like swelling to appear between the claws,* and although at times this may be a true cyst, there is no doubt that sometimes it is due to the presence of a foreign body. The following cases, which recently came under my observation, not only exemplify this fact, but are interesting, or at any rate singular, by reason of the fact that in each instance the foreign body was identical in character, viz., *an awn from a spikelet of wild barley grass.*

In July, 1905, a retriever was brought to the infirmary suffering from lameness, which examination showed was due to the existence of one of these cyst-like swellings between the claws. The swelling had burst and a glairy, semi-purulent fluid was constantly discharged from the wound. There was considerable irritation of the affected part, the dog continually licking it. I explored the sinus with a fine probe, exposed the interior with a scalpel and director, and upon searching the interior found an *awn of barley grass.*

Having at the same time another case in an Irish Terrier, in which the swelling had not been freely opened, but was being treated at the owner's house simply by antiseptic baths, &c., I lost no time in following the treatment adopted in the previous case. Exposure of the interior of the cyst again revealed the presence of *an awn* precisely similar to the above. Removal of the awn was in each instance followed by rapid healing of the sinuous wound.

The coincidence between the two cases was very striking, but was to be rendered still more so. About the middle of July in the present year, the *same* Irish Terrier was brought to me again, suffering from a swelling between the claws. My assistant, Mr. Gale, M.R.C.V.S., on probing and opening the swelling, extracted an *awn of barley grass*, thus completing the third case in which the causative agent was absolutely identical in nature. As before, removal of the awn was followed by healing without further trouble.

Whilst writing the above brief notes another case recurs to my mind in which the awn of grass was the offending foreign agent. A lady requested my attendance on a favourite cat, which for several days had been suffering from eye trouble. The left eye showed acute conjunctivitis and keratitis and considerable swelling of the eyelids. After much trouble (I had no cocaine with me) I succeeded in examining the eye and thought I had caught a glimpse of a yellowish foreign body behind the cartilage nictitans. With a pair of forceps it was readily withdrawn and on further inspection it stood revealed as an *awn of barley grass!* I am wondering where and when I shall next meet this ubiquitous awn.

* A capital illustration appears in Hobday's "Surgical Diseases of the Dog and Cat," p. 355.

CASE OF SAND COLIC IN A MULE.

BY LIEUT. T. E. BURRIDGE A.V.C., BLOEMFONTEIN, SOUTH AFRICA.

THE animal, a North American mare mule, aged 8, was admitted to the hospital on January 15, 1906, suffering from colic, and died on the 17th. There were two previous attacks in December, 1903, and one in May, 1904.

On opening the abdomen the stomach was found to be enormously distended to three or four times its natural size from fluid ingested, and the lining mucous membrane highly inflamed, as was also the case with the small intestines.

The cæcum was impacted for nearly its entire length with a mass of sand, which weighed 36 lbs. It was black in colour, and quite pure, there being no admixture of food with it. The mucous membrane was inflamed in patches.

The animal was manger-fed and had half an ounce of salt daily in the food, and in addition a lump of rock-salt was left in the manger.

While under treatment no sand was passed, as is usually the case.

RUPTURE OF THE CÆCUM IN A KITTEN.

BY T. C. FLETCHER, M.R.C.V.S., SHEFFIELD.

THE subject was a kitten, 7 months old, and the animal had been vomiting and passing diarrhœa for a week, taking no food, but drinking plenty of water. By my instructions it was brought into the infirmary. On April 13 the vomiting had apparently ceased, but there was no appetite, although the patient was not prostrate.

Death occurred about six o'clock on the evening of May 2. The kitten had taken no food that day, but was fairly cheerful, and I had not anticipated a fatal termination so soon.

The *post-mortem* examination showed that peritonitis was present, there being an escape of a thin, milky fluid into the abdominal cavity, and an examination of the intestine revealed a rupture of the cæcum at the ileo-cæcal juncture. I think the case worth recording on account of the rarity of its occurrence, especially in so young an animal.

AMAUROSIS AS A SEQUEL TO CASTRATION.

BY C. W. TOWNSEND, M.R.C.V.S., LONG CLAWSON, CAMBRIDGE.

THE patient, a two-year-old colt, was operated upon in a standing position with the ecraseur; there was not any undue amount of hæmorrhage afterwards, and to all appearances the patient was, at the time of operation, in perfect health. About a week afterwards the owner sent for me, as he stated that he thought the colt had gone blind. This fact was perfectly apparent to any one, the horse showing the usual symptoms of blindness, carrying its head and ears in a

listening attitude, refusing to gallop by itself, and picking up its feet (when trotting) much higher than normal.

Upon examination of the eyes I found the pupils widely dilated, the lesion being that of amaurosis. The cause of this sequel seems difficult to explain, as there was certainly no undue hæmorrhage nor other complication. The animal never recovered its sight again.

A CASE OF TETANUS AFTER PARTURIENT APOPLEXY IN A COW.

BY C. W. TOWNSEND, M.R.C.V.S., LONG CLAWSON, CAMBRIDGE.

THE patient, an aged Shorthorn cow, was found upon my arrival to be suffering from all the usual symptoms of milk fever. I gave a purgative internally, following this by stimulants every three hours and by injection of the udder. After a few hours she could stand up, and would eat almost anything that was given to her, apparently being well on her way to recovery. Five days later I was telegraphed for, as the cow was breathing heavily, the pulse very quiet and weak, the membranæ protruding over the eyeballs, the jaws almost completely locked, the muscles tense and hard, and all the usual symptoms of tetanus. The animal died during the night, and, although I made a careful *post-mortem* examination, I was unable to discover any evidence of the initial wound, although I particularly searched along the generative tract.

As this is rather an uncommon sequel to milk fever, I thought the case worth recording.

EXTRACTS FROM A LAST CENTURY'S CLINICAL NOTE-BOOK.

BY THE LATE JOHN DUNSTAN, ST. MELLION, CORNWALL.

(*Continued from p.* 444.)

POLL EVIL.

1815. Miss H. W.'s horse cured of a poll evil by putting caustic in one hole and dressing the wound up to the core, afterwards dressed with blue lotion, train oil, and Armenian bole.

BOG SPAVIN.

Mr. S. L. had a horse with a bog spavin inside and outside the hock. Cured by caustic, and took large core out.

HÆMATURIA.

1815. T. E., Esq., had a horse which made a quantity of bloody water. Bled the kidney vein and given two ounces of Armenic bole and one ounce of diapente in milk. Got all right.

A Severe Wound.

1815. Mr. N. P. had a cow ruptured very bad, with the flesh broke off near the thigh. Sewed the inside film. Cured.

A Case of Chronic Foot Lameness.

1815. Mr. B. had a horse cured of lameness by drawing the sole of the foot.

A Severe Sprain.

1815. Mr. S. had a horse badly strained in the shoulder. Cured by swimming, bleeding the plait vein and rubbing in oils. All right.

Drawing the Sole.

1815. Mr. E. S. had a horse cured by drawing the sole of the foot after being brought to St. Mellion on three legs.

A Tumour.

1816. Mr. B. had a mare with a large callus in her side. Cured by caustic, a very large wound when the core came out, but healed it with blue lotion and train oil and Armenian bole.

Dystoxia.

1818. Mr. R. C. Taking off a calf from the cow; nothing but the tail appeared, the calf dead. Put two crooks, one over each pin, and took him off by two cords with several men's assistance. Took off the calf bed afterwards and used Clater's oils. All right.

Prolapse of the Uterus.

1818. Mr. H. H. Cow's body out very large and constantly bleeding. Put in the part and ringed her. By the time I was home at St. Mellion she bursted the ring, the body all coming out again, and I was obliged to ring her very deep. Used Clater's oils. All right.

Operation for Hernia.

1818. A mare from Mr. S. was brought to St. Mellion swelled very large in the flank near the thigh. I throwed her on the ground and found the part where she was ruptured. The film broke off the other thigh. I kept her from August 2 to September 16, and she was then sold for £20.

Toxic Effects of a Mange Application.

1818. Mr. S. C. had three horses cured of the mange; one of the horses dropped and lay on the ground, as if salivated, for two hours. 7s. 6d. per horse.

Colic.

1818. Mr. W. R. had a mare with violent pain in her bowels. Gave her first day half pound of salts and one ounce of ginger, and bled her well in the neck and mouth. Next morning gave her half a pound of butter and one ounce of pepper in a quart of warm milk, and clystered her twice with half a pound of salts and half a pound of oil in each clyster. The same evening gave a pint of castor oil, and the next morning a pint of juice of groundsel, and clystered her twice as before. In the evening gave a ball, twelve drachms of aloes and four drachms of calomel mixed with liquorice, and the next morning

clystered her as above. The pain then began to abate, and the physic operated a very little. The mare was in foal at the time, and foaled the following season. All well. The mare was taken ill November 7 and continued till the 10th. All right.

Recipe for a Mange Dressing.

1818. Mr. H. N. Four horses cured of the mange, 7s. 6d. each. One quart of spirits of tar, one pint of train oil, one pound of sulphur vivum.

A Case of Hernia.

1819. Mr. S. B. had a cow ruptured very large but no skin broken. I turned her on her back and the entrails returned to their place. I cut the skin very large as the wound in the film was very large and sewed the inside film with strong wax thread, and put several stitches on the outside. I used plenty of strong spirits, and attended to her from January 14 to February 12. All right.

Choked when Drenching.

1819. March 11. I gave a drench to Mr. W. W.'s horse, after which he lay on the ground for five or six hours as if dying, froth working to the mouth. He recovered and went home. The drench went into the wrong passage. Got all right.

A Fractured Spine.

1819. Mr. J. P. called me in to a horse which I throwed and fired all four legs of him. As I was going to heave him up he gave a struggle and broke his back.

(*To be continued.*)

OBSERVATIONS UPON ERGOT AS AN ABORTIFACIENT.

BY ARTHUR J. BURLEY, ANGOLA, NEW YORK.*

Historical.

The medicinal uses of ergot date back some centuries. Some of the earliest references during the sixteenth century show that some of its virtues were already known to the masses, and that it was used extensively in obstetric practice. Numerous epidemics due to ergot are reported during the eighteenth century. Salerne proved the poisonous effects of ergot on pigs, ducks and fowls; the animals dying of gangrene. He corroborated the statement that the fresh ergot was the most virulent and that, after some months, it sweated and lost its poisonous properties.

Allusions to ergot were quite numerous during the eighteenth century, it being used mainly by the lower classes and by charlatans with criminal intent. In France, its use was interdicted in 1774. Its reputation declined, but was later revived by the efforts of American physicians. Drs. Stearns, 1807; Akerly, Prescott, 1813; Chapman,

* From the Laboratory of Dr. Pierre A. Fish, in the New York State Veterinary College.

Dewees, 1817-1818; and Altee, in 1821, largely contributed to turn the tide in its favour. European physicians combated the idea of its efficiency, but ergot was finally admitted to the London Pharmacopœia in 1836.

Physiological Action.

Digestive System. — In large doses ergot is a gastro-intestinal irritant, occasioning considerable heat and dryness of the throat, accompanied by thirst and succeeded by pain in the stomach and bowels, vomiting and occasional purging, with violent peristalsis, although constipation is the common sequence.

Circulatory System.—Repeated medicinal doses increase the blood pressure, although rendering the pulse slower and smaller, the result primarily of stimulation of the vaso-motor centre, followed by peripheral action causing a tonic contraction of the small unstriped muscle fibres.

A poisonous dose lowers arterial tension, causing the pulse to beat faster and softer—an effect due to the exhaustion from over-stimulation or to direct depressant action upon the heart muscle. It is claimed by competent authority, that there is no active and actual contraction of the arteries as a result of stimulation of the vaso-motor system, but that the arteries contract because of the fulness of the veins, there not being sufficient blood to fill both systems—marked arterial anæmia resulting. Some difference of opinion exists as to the effects upon the circulatory system.

Experiments by the writer on the heart of a frog show that the force of the contraction is increased. The writer here gives an illustration of a tracing of the normal heart beats of a frog and also tracings after the application of ergot.

It is claimed by Willebrand that the normal or hypertrophied heart so contracts under the action of ergot, that the difference in size is appreciable by percussion. No specific effects upon the blood have been described.

Nervous System.—Medicinal doses have no especial action, though excessive doses sometimes depress the sensory mechanism, producing general cutaneous anæsthesia. Among the physiologic effects of toxic doses is stimulation of the organic motor centres.

Respiratory System.—Medicinal doses produce no particular effect. Large doses depress the respiratory centre, rendering the breathing shallow. This action is manifest from the first, there being no primary stimulation of the respiration. Death from an overdose of ergot usually results from paralysis of the respiratory centre.

Temperature.—No special action has been observed. Toxic doses cause cold skin; the limbs, ears, horns and tail lose their natural warmth.

Eye.—The calibre of the retinal and nutrient optic blood-vessels is reduced, resulting in marked pallor of the disc, transitory amblyopia and papillary anæmia.

Uterus.—In some respects the most important action of ergot is upon this organ. Except in labour no appreciable effects are produced by very small doses, although large doses are said to produce contraction. In therapeutic doses the principal action of the drug is on unstriped muscle fibres. It causes especially, the contraction of the blood-vessels and contraction of the uterus. Its action is most

strikingly exemplified during pregnancy. It produces, in full doses, tetanic, tonic contraction of the uterine muscle, the uterus being hard and pale, forcing the blood out of the uterine arterioles.

The uterine contractions are attributed, in part, to stimulation of the parturition centre in the lumbar portion of the cord. The precise manner in which ergot affects the uterus is still a matter of discussion. It is fairly well demonstrated, however, that the drug acts both centrally and peripherally owing to its different constituents, cornutin acting centrally and sclerotic acid peripherally.

Ergot has been studied as much or more than any drug in the *materia medica*, and if opinions vary as to its *modus operandi*, it is because a very complex substance is dealt with, the nature and even the number of its constituents being as yet inadequately known. Some of the principles of the drug are unstable, and variable in their influence. Tanret's ergotinin, for example, is said to be without effect upon the uterus. Bonjean's ergotin, is a powerful ecbolic, and has marked action, moreover, upon the vascular system.

Bladder.—In animals poisoned with ergot, the bladder may be found distended with urine or empty and firmly contracted. In the first instance, there is a spasmodic contraction of the vesical sphincter; while in the latter case the entire muscular structure of the organ is under the influence of ergot. Peton noticed soon after an injection of ergot the appearance of fibrillary contractions resulting in the complete evacuation of the organ; in other cases the contractions alone were seen. Wernich observed the same phenomena and recommended close attention to the regularity of micturition in patients treated with ergot, and should retention occur, the use of the catheter (Evetsky).

Absorption and Elimination.—The active constituents of ergot are rapidly absorbed into the blood and are eliminated principally by the kidneys, increasing the urinary flow. It is well established that ergot does not pass into the milk. Evetsky discovered a substance resembling ergot in a womb discharge of a woman healed with ergot for a uterine fibroid tumour.

Muscle.—In therapeutic doses the principal action of ergot is on unstriped muscle fibre. It causes especially the contraction of the blood-vessels and of the uterus. Some experiments made by the writer indicated that the gastrocnemius muscle of the frog contracted somewhat more forcibly under the influence of ergot.

Experimental.

The action of ergot upon the uterus is quite fully described in the text-books on *materia medica*, but any literature bearing upon direct experimental evidence of this action the writer was unable to discover. The experimental work was, therefore, confined almost entirely to a study of this drug upon the uterus of pregnant cats.

I am indebted to Dr. P. A. Fish for the data of two experiments upon pregnant cats, which he carried out in the spring of 1904. On April 16th, he injected hypodermically 1 cc. of aseptic ergot (Parke Davis) at intervals of about one hour until five doses had been administered. On the following day, April 17, it was found that the cat had given birth to three living kittens which were well enough

developed to nurse from the mother. The mother appeared bright, and did well afterwards.

Cat No. 2 was experimented upon the same day, but in this instance the fluid extract, of ergot (Parke Davis) was used. One drachm of the fluid extract, diluted with 2 drachms of water, was administered through a rubber tube directly into the stomach. Five doses were administered in all at about one hour intervals. On the following day (April 17) it was found that two dead but quite fully developed kittens had been born. On the morning of April 18 another dead kitten was found, and the mother seemed to be in considerable distress. At 2 p.m. she was found dead. The *post mortem* showed two more kittens in the uterus. One with head presenting in the vagina and badly squeezed out of its natural shape. The uterus was much congested and appeared to be almost gangrenous, with considerable bloody exudate in the abdominal cavity.

The remaining experiments were carried on under the direction of Dr. Fish, the special object being to note the oxytocic properties of the drug, and incidentally the after-effects upon the mother and fœtus. In the majority of cases the fluid extract of ergot (Parke Davis) was used ; the dose being 1 drachm diluted with 2 drachms of water introduced directly into the stomach through a rubber tube.

Cat No. 3. On March 21, 1905, four doses of the fluid extract were administered as above described at intervals of two hours. On the following day no signs of abortion were observed, although the cat seemed slightly indisposed. On March 23 five doses of the drug were given at similar intervals, but no symptoms were observed on the following day. On April 8 the experiment was repeated, but the ergot was given at intervals of one hour instead of two. On the following day, at 10 a.m. the cat seemed uneasy, looking around at the flank and appearing as if to make preparation for the act of parturition. At 10.45 she gave birth to four kittens, two of them dead. At 2 p.m. she gave birth to another live kitten. The following day all of the kittens were dead except one, and this lived only twenty-four hours longer. The kittens seemed quite well developed although small. They were not seen to suck nor did mammitis develop in the mother.

Cat No. 4. On April 22, 1 drachm doses of the fluid extract were administered every half hour up to five doses. No symptoms were observed on the following day, except slight muscular tremblings. On April 25, four doses were given at half hour intervals. Shortly after the fourth dose she gave birth to a kitten (10.30 a.m.). At 2 p.m. another kitten was born. These kittens were smaller and possessed less hair than those of No. 3. The cat was more indisposed and did not recover so rapidly as No. 3.

Cat No. 5. The experiment was carried out as on No. 4. Emesis occurred after the third dose. Dosage was begun at 4 p.m., May 3, and at 9 a.m. the following morning she gave birth to a kitten quite immature, and less than half grown. It measured only 5·6 cm. in its fœtal membranes. No other kittens were observed. On May 9 the cat was killed and a *post mortem* held. The uterus showed that four kittens had been present, and it was assumed that the mother ate up the remaining immature kittens, as she was not constantly observed during the whole of the experiment. The mother's health had been excellent up to the time of the *post mortem*.

Cat No. 6. On May 19 four doses of ergot were administered at half hour intervals. There were no results on the following day. Similar doses were administered May 22, with emesis after the third dose. No abortion or other symptoms were observed. The cat was killed, and four kittens near term were found in the uterus.

Three other cats were experimented upon, but the *post mortems* showed they were not pregnant.

Summary and Conclusions.

Of the six pregnant cats experimented upon, five gave birth to their young within a reasonable time after the administration of the ergot. Some of the kittens were probably near term, because of this it may be suggested that normal labour may have occurred independently of the ergot. In the absence of any data relating to the time of impregnation absolute proof is impossible; but the fact that cats 1 to 5 inclusive gave birth to their kittens within twenty-four hours after the last dose of ergot, renders it highly probable that the act of parturition was not a coincidence correlated with normal labour, but was due to the action of the ergot.

In cats 1 and 2 the treatment was simultaneous (except for the form of the preparation of the drug); the act of parturition was also simultaneous. This fact, it seems to us, is deserving of more weight than that the kittens were near term.

Cat No. 3 required three sets of experiments at intervals of a few days before parturition effects were produced. The kittens, although apparently quite well developed, were small. Two of them were born dead. The remaining three were unable to nurse and soon died; and the conclusion was reached that they were born prematurely.

On cat No. 4 two sets of experiments were tried within an interval of three days. Shortly after the last dose the act of parturition set in. The kittens were even more immature than those from cat No. 3, and their birth is quite reasonably attributed to the action of the ergot.

On cat No. 5 the ergot unquestionably produced abortion, as the kitten was not more than half its term and measured only 5·6 cm. in length. This experiment emphasised the necessity of close observation because of the tendency of the mother to eat the immature young. If the act of parturition is not observed and if no fœtus is found (because of its having been eaten), the conclusion would be reached that the drug had exerted no action.

Two sets of experiments, within an interval of three days, were performed upon cat No. 6 without result. It is possible that more of the drug was needed in this case, as in cat No. 3, or that the cat was less susceptible than the others.

The effect of the ergot upon the mothers was apparently not harmful except in cat No. 2, where there was a fatal termination, and in cat No. 4, where there was some indisposition for a time, but ultimate recovery ensued.

In some cases a few of the fœtuses were born dead, and others died soon after birth, while a few survived. The former conditions might be expected if the birth was premature.

From these experiments the conclusion seems reasonable that ergot has the power of stimulating the gravid uterus to the extent of emptying it of its contents, in the cat.

Some difference in susceptibility was noted. Cats Nos. 1 and 2 required only five doses; cat No. 3 required fourteen doses in three series of experiments, and Nos. 4 and 5 nine doses in two series of experiments.

The doses should be rather large and administered with due frequency in order to produce abortion.

ABSTRACT FROM THE REPORTS OF THE CHIEF VETERINARY SURGEON AND THE ASSISTANT VETERINARY SURGEONS OF THE CAPE GOVERNMENT FOR 1905.

THE following is a full list of the Veterinary Officers serving on the Staff at the end of the year: D. Hutcheon, M.R.C.V.S., Chief Veterinary Surgeon, Cape Town; W. Robertson, M.R.C.V.S., Bacteriologist, Cape Town; J. D. Borthwick, M.R.C.V.S., Senior Assistant, Somerset East; T. Bowhill, F.R.C.V.S., Director of the Veterinary Laboratory, Grahamstown; R. W. Dixon, M.R.C.V.S., Assistant, East London; S. Elley, M.R.C.V.S., Assistant, Beaufort West; G. W. Freer, M.R.C.V.S., Assistant, Uitenhage; A. Goodall, M.R.C.V.S., Assistant, Worcester; C. Goundry, M.R.C.V.S., Assistant, Cape Town; M. A. Hutchence, M.R.C.V.S., Assistant, Kokstad; P. X. Kearney, M.R.C.V.S., Assistant, Umtata; J. H. Lyons, M.R.C.V.S., Assistant, Cape Town; J. Neill, M.R.C.V.S., Assistant, Vryburg; W. G. Pakeman, M.R.C.V.S., Assistant, Molteno; R. Paine, M.R.C.V.S., Assistant, Elsenberg; J. A. Robinson, M.R.C.V.S., Assistant, Mossel Bay; J. Spreull, M.R.C.V.S., Assistant, Grahamstown.

INCREASE OF VETERINARY STAFF.

I have repeatedly directed attention to the limited number of veterinary surgeons attached to this Department, considering the enormous area of country in which they have to operate and the multifarious duties which they are expected to discharge. The principal duties of a Government Veterinary Staff should be to deal with the infectious diseases of stock, to assist in the administration of the Contagious Diseases of Animals Act, and to conduct investigations into the nature, cause and prevention of the numerous diseases of stock which are indigenious to the Colony. But there has been a continuous growing demand by the farming community that the veterinary surgeons should be made available to attend to the common diseases of farm stock, to castrate their colts, inoculate their cattle, and perform all sorts of minor operations. This demand of the farmers we have tried to meet, as far as possible, consistent with the discharge of the more pressing and important duties of attending to outbreaks of infectious diseases. But, unfortunately, the farmers are not satisfied with this, and complain, very ungenerously, I think, when some valuable animal becomes sick and I have been unable to send a veterinary surgeon at once to attend to it. I readily admit that it is very desirable that the farmers should be able to obtain veterinary advice and assistance when their valuable animals become sick. But it is unreasonable to expect that such assistance can be given in a

satisfactory manner with the limited number of veterinary surgeons at the disposal of the Department.

Complaints are sometimes made by individual stock-owners, regarding the inattention or inefficiency of individual members of the Veterinary Staff, because they have been unable to render successful veterinary assistance when called upon, most probably under exceptional circumstances; and both the officer in question and the whole of the Staff are inconsiderately branded as incompetent; and the good work which has been accomplished during the last twenty-five years is entirely forgotten. But if any reasonable man will consider the circumstances under which our veterinary surgeons are placed he will recognise that it is impossible for them to give the satisfaction expected of them.

They are at the call of every stock-owner within one hundred miles or more of their headquarters, but they are inconsiderately expected to be always at home when telegraphed for, and should they fail to arrive in time to render efficient aid to the sick animal, the officer and the Service is condemned as useless, and their retention described as a waste of public money, which in one sense it is. At any rate, it is not using it to the best advantage.

Still, this anomalous position of the Veterinary Staff is maintained, and no serious attempt is made to grapple in an effective manner with the the numerous diseases of stock which still require investigation. If it is the intention of the Government to give veterinary advice and assistance to stock-owners, with regard to the common diseases, and simple operations of their animals, then a veterinary surgeon should be placed in each district or manageable area, and a certain tariff of charges made for veterinary attendance, as is done with so much benefit and satisfaction in Natal. Under such an arrangement it would be possible for the Veterinary Staff to render real and efficient assistance to the stock-owners in the management and treatment of their animals. The salaries of the additional veterinary surgeons required to carry out such an arrangement would be largely counterbalanced by the fees received, and the saving in time and money that are lost by the long railway and cart journeys which have to be undertaken under the existing arrangements.

The farmers rightly consider that the live-stock of the Colony are becoming too valuable, and farming operations too precarious, to trust any longer to casual observation and experience to solve the intricate problems connected with the origin of South African stock diseases. I have repeatedly pointed out that the live-stock industry of this Colony is by far the most valuable branch of agriculture which it possesses, and the one which is capable of the greatest development. In connection with this subject, it is necessary to add that the veterinary officers fully recognise that a great deal of patient experimental work requires to be carried out before the originating causes of the numerous diseases peculiar to the live-stock of this country can be properly elucidated. And the measure of success which has already been obtained by the experimental work they have been able, under the circumstances, to undertake has inspired the members with a desire to initiate similar experiments for the investigation of the diseases remaining to be studied. But it will be admitted that the conditions under which the majority of the members of the Staff have to carry out their duties at

present do not tend to maintain the enthusiasm of the most zealous of officers. I sincerely trust, therefore, that due consideration will be given to the demands of the farmers for increased veterinary assistance.

Native Superstition in the Treatment of Disease.

Veterinary Surgeon Kearney reports that as most of the live-stock in the Transkei belong to the natives, it is extremely difficult to deal effectively with the several infectious diseases there. The natives are very superstitious, and strongly averse to accepting opinions and advice from the white man, unless he is someone they know, and who possesses some authority or influence over them. It is this difficulty in getting the natives to fall into line which makes it so difficult for the European stock-owners to keep their cattle free from infection.

On my last visit to some native kraals, at which the cattle were affected with lung-sickness, I found that the native stock-owners had been induced by another native—who evidently possessed self-confidence sufficient to overcome his lack of knowledge—to inoculate their cattle in the shoulder with bluestone. We tried our best to persuade these people to kill one of the affected cattle, in order to obtain virus to enable me to inoculate the cattle properly, but we failed. I am glad, however, to state that the failure of the bluestone to prevent the disease from spreading induced them to send for me later to come and inoculate their cattle. Individual experience is not alone an expensive teacher, but it is a terrible hindrance to progress. Another example of the natives' distrust of the ways of the white man is frequently shown when I go to inoculate a European owner's cattle for quarter-evil. Usually one or more calves in the herd belong to the native boys. These are invariably removed by their owners before the operation commences. In numerous instances, these uninoculated calves contract the disease and die, while those inoculated are unaffected. The Kaffir's dead calves thus becomes an object-lesson in the value of inoculation for "sponsziekte."

Tuberculosis.

It is very manifest that this disease is becoming more and more prevalent amongst the dairy herds of the Colony, more particularly those in the Cape peninsula; and unless effective measures are taken to eliminate the affected animals from the herds, the position will become a serious one for many of the owners of valuable herds of cattle who at present are afraid to apply the tuberculin test to them, lest it should reveal a widespread infection. Meantime the public health is being seriously endangered, more especially the infants who are reared on cow's milk.

I wish to repeat the remarks which I made in my Report for the six months ending June 30, 1904, on this subject, viz.:—

The position of the law with regard to tuberculosis in local cattle is very unsatisfactory at present. It is scheduled as an infectious disease, and all visibly affected animals can be dealt with, but we have no power to apply the tuberculin test to the cattle which have been in close contact with the affected animals, nor can we condemn those that react to the test, even if the owner consents to have it applied. Further, should an honest dairyman report the existence of a case of tuberculosis in his dairy herd, and request us to submit all his cattle

to the tuberculin test, and consent to kill every one that reacted in order to eradicate the disease from his herd, such a man, instead of gaining the confidence of his customers by this voluntary sacrifice, is more likely to lose their support through the publicity given to his action; he is thus made to pay a severe penalty for his honesty, while his customers transfer their patronage to a dairy whose owner is not troubled with any such conscientious scruples about the public health.

It will thus be seen that the present condition of the law is a terror to the honest man, while it encourages the dishonest man to conceal the condition of his dairy cows. It is unnecessary to add that this is a matter which should be remedied as early as possible in the interest of both the dairyman and the general public.

Vaccination against Anthrax.

Veterinary Surgeon Neill reports that in Bechuanaland anthrax has been very prevalent amongst all classes of stock, but more particularly in cattle and small stock. Pasteur's double vaccination has, however, been adopted by a number of the farmers where the disease has appeared, and with excellent results; no fatalities have occurred from the inoculation, and the disease has invariably been arrested.

Mr. Neill strongly recommends that on farms where the disease is liable to recur the stock should be vaccinated annually as a preventive. Individual farms are already adopting this method, and with success.

Veterinary Surgeon Robinson reports that a few cases of anthrax, chiefly in cattle, have lately come to his notice. He regrets to say that very great carelessness is shown by the general public in reference to this disease, considering its dangerous character. On one farm in the Mossel Bay district, horses, cattle, and ostriches became affected, and also two natives, who were employed in skinning dead animals, before the nature of the disease was realised. The in-contact cattle were all treated by the Pasteur method of double inoculation with satisfactory results, but the ostriches are still dying, and he is experimenting on some of them to test whether the use of protective virus would be as effective for them as for other farm animals.

Veterinary Surgeon Hutchence reports an outbreak of this disease which was attributed to the cattle being supplied with unsterilised bone-meal. Ten cows died: the herd was vaccinated, and the deaths stopped. Some outbreaks in the Lower Albany District have also been attributed to the cattle receiving unsterilised bone-meal.

Veterinary Surgeon Bowhill reports that the results obtained by the imported vaccines have been excellent.

Veterinary Surgeon Dixon states that within his area the outbreaks of anthrax occur more particularly amongst transport oxen, and the indications are that these pick it up on the outspans, many of which have become infected, largely due to the neglect to bury the carcases of animals which die of that disease. He expresses his confidence in the efficacy of vaccination with Pasteur's vaccine, but he has been using *double* the dose usually recommended for cattle. He does not consider that the usual dose confers a reliable immunity, where the infection is strong.

Veterinary Surgeon Spreull refers to an outbreak of anthrax which appeared at Glen Cullen, in the Bedford District. He inoculated

nearly 3,000 small stock, 180 cattle, and 25 horses and mules. All did well, and the disease appeared to be arrested. In June a police horse died of anthrax on Bedford Commonage. He therefore visited the village, and inoculated the police horses and others grazing there. No further cases appeared.

Vaccination against Quarter-Evil—"Sponsziekte."

Veterinary Surgeon Freer states that the farmers are becoming convinced of the efficacy of inoculation as a preventive of this disease. He inoculated 750 young cattle during the latter portion of the year. Out of these, only three deaths occurred. Half of the number he inoculated in the dewlap without a single untoward result. He adds: "This method is much easier, the effects more certain, and the risk is apparently small." He strongly recommends the method.

Veterinary Surgeon Dixon reports that within his area the calves are being inoculated each year as they come on. By this means the the disease has practically ceased where it used to be prevalent.

Veterinary Surgeon Kearney reports that "sponsziekte" claims a large number of victims in the Transkei. The double inoculation is a great drawback to its application—when both operations have to be carried out by the veterinary surgeon.

It is very desirable that a satisfactory single inoculation should be devised. He expects that inoculation for "sponsziekte" will become generally acceptable in that territory when once it becomes better known.

Veterinary Surgeon Neill reports that in January, 1905, he vaccinated about 200 head of young cattle against quarter-evil for one farmer, who lost twenty by this disease last year. He completed the second vaccination, and was pleased to say that not one death had occurred amongst his young cattle during the year, nor did any bad results follow from the vaccination. It is of interest to add that all the vaccinations were made behind the shoulder, and not on the tail.

Two other outbreaks of quarter-evil Mr. Neill dealt with in the same manner, and with equally satisfactory results.

Specific or Infectious Ophthalmia in Ruminants.

This infectious form of inflammation of the eyes in sheep, goats, and cattle is becoming more prevalent every year, and is continuing to extend over a large area of the Colony. A very good illustration of its infectious nature occurred during the early part of last year. A Bechuanaland farmer purchased a large number of breeding cattle at a sale which took place at a dairy farm near Cape Town. This infectious disease of the eyes had recurred, almost every summer, on this particular farm, although the cattle did not appear to be affected at the time of the sale. After purchase, these cattle were taken up to Bechuanaland, and placed amongst the owner's other cattle, which were running on his farm there. The disease was observed almost immediately after amongst the newly purchased cattle; and it very soon extended to the cattle native to the farm, and affected the greater proportion of them. This farmer assures me that he had never seen the disease amongst his cattle on that farm previously. This is strong proof that this specific ophthalmia of cattle is not due to any peculiar local conditions, such as the pollen of certain plants, but that it is a

special infectious disease, which is spread from animal to animal, very probably by flies or a similar medium.

Veterinary Surgeon Freer mentions it as being prevalent in his area. With regard to treatment, he says:—

"My experience has taught me that the less the eye is interfered with in this disease the better the ultimate results. Weak solutions of boracic acid applied daily and care being taken to see that the animal gets sufficient food, result in complete recovery in 95 per cent. of the cases."

Veterinary Surgeon Elley met with it more particularly in sheep. He says this troublesome epizootic has caused some loss in his area in the past year, particularly in the Nieuweveld Mountains. Its effects are mostly felt during drought, when food is scarce, the blind sheep being the first to die from starvation. Farmers are beginning to realise the necessity for removing any sheep from the flock as soon as their eyes are noticed to be inflamed. Affected sheep or goats should be kept out of the bright sun; calomel or silver nitrate appears to be the most beneficial application, and when the outbreak threatens to be a serious one, he considers it a good plan, and well worth the time required, to bathe the eyes of all the flock once, or even twice, weekly with Jeyes' fluid or some such antiseptic.

Veterinary Surgeon Pakeman also reports that he had a large number of these cases of ophthalmia to deal with, more particularly in calves and older cattle. The cases, however, yielded quickly to the mercurial treatment, which consists in washing out the eyes thoroughly with a weak solution—1 grain to 2,000 of water—of corrosive sublimate.

Veterinary Surgeon Neill also met with outbreaks of this epizootic ophthalmia, both in cattle and sheep. He reports that he was very successful with the perchloride of mercury solution, washing out the eyes with a syringe.

Glanders.

Veterinary Surgeon Elley reports: "I had several outbreaks of glanders to deal with at the beginning of the year, when on duty in Cape Town and the south-western districts, its greater prevalence in those parts being undoubtedly largely due to the greater number of speculators dealing in horses between Cape Town and the towns in the district. It might be advantageous if municipalities could insist upon the application of the Mallein test by a duly qualified veterinary surgeon on all horses brought into their district for disposal, from centres where glanders is known to exist.

"Since my arrival in Beaufort West, I have had one outbreak involving two farms in this district, and three infected centres between Phillipstown and De Aar Districts. The Mallein test has been applied to every in-contact which could be traced, and those reacting together with those clinically affected were immediately destroyed, and the premises quarantined until thoroughly disinfected. I consider the application of the Mallein test to every animal which may possibly have been in contact even more essential in the Karroo than elsewhere, for in this climate horses not only live much longer after showing symptoms of glanders, but animals will go many months, if not years, after infection before showing any clinical lesions."

Veterinary Surgeon Borthwick reports that "During the year I

have attended to a good many outbreaks, but none of them involving any large numbers of horses, and have been successful, so far, in stamping the disease out in each case, no recurrence taking place. In connection with the use of Mallein, I would again urge the absolute necessity for the exercise of some Government control over its application. The horse-owners are now aware of its diagnostic value, and I am afraid that some do not hesitate to make use of it, and then immediately sell those horses which react."

Veterinary Surgeon Gourday states that "In connection with this disease I wish to add my testimony to the value of Mallein as a diagnostic agent, and would suggest that its use be strictly under Government control, and thus prevent animals which have been tested by laymen, and which have reacted, being sold to the general public.

"I am glad to report that the farmers in the Malmesbury and adjoining districts are now more or less conversant with the symptoms of glanders, so are thus not likely, as formerly, to confound this disease with strangles or "nieuwziekte." Many of the glanders cases in those districts have been traced back to animals left on farms by the various travelling dealers in horses, many of whom seem quite callous as to the ruination which follows in their train, when they prevail on a farmer to let them leave a sick horse on his farm, which they say they will call for again. Needless to say, they are seldom seen again. However, many of the farmers having suffered great losses in the past from this cause, are now very careful what animals they allow on their farms."

Similar remarks on the value of Mallein as a diagnostic agent and of the desirability of having its sale placed under the control of the Government have been made by all the members of the Staff.

Diseases of the Dog.

The principal cause of the very heavy mortality amongst dogs, more especially in certain areas in the Cape peninsula, and along the east coast districts of the Colony, is malignant jaundice, malignant malaria, or *Piroplasma canis*, the transmitting agent of which has been shown by Mr. Lounsbury to be the South African dog tick, *Hæmaphysalis leachi*. No simple and effective method of keeping dogs completely free of these ticks in an infected area has yet been discovered, and the preventive and curative treatment has not been much advanced. The mortality is still very high under the most approved methods of treatments. Investigations are still being conducted, however.

The ordinary distemper of dogs is not very common in this Colony, but a very remarkable fact is that when it does occur, a large percentage of the cases terminate in chorea.

Veterinary Surgeon Elley reports that distemper has been very prevalent, and of a serious character during the year, particularly so for a Karoo district like Beaufort West.

The disease appears almost invariably to take the nervous form; he has only once seen the enteric, and never the pulmonary. Chorea of a most persistent nature, is the too frequent sequel. Fresh air and the most nourishing nerve tonics form the treatment recommended, but the most careful attention and nursing must be freely given, if bene-

ficial results are to be looked for when once nervous symptoms have appeared.

Mallein, 1905.—*Mallein prepared and issued January* 1 *to December* 31, 1905: 5,000 doses balance from 1904; 19,000 doses prepared in 1905; 12,700 doses issued to foreign Governments, £211 13s. 4d.; 1,820 doses issued to Government Veterinary Staff; 772 doses issued to others on payment, £14 6s.; 8,708 doses in stock, December 31, 1905. The Mallein is supplied at the low charge of 4d. per dose of 1 cc.

Review.

JOURNAL OF THE ROYAL SANITARY INSTITUTE, September, 1906.

This month's issue of the above Journal deals almost exclusively with the proceedings of the Section of Sanitary Science and Preventive Medicine at the recent Congress of the Institute at Bristol. Consequently, it contains little of special interest to veterinarians. The address of the President of the Section, Sir W. J. Collins, M.P., M.D., M.S., &c., is, however, very interesting and instructive. The special point which the President endeavours to make out is that the microbe theory of the causation of disease is probably being over-emphasised, with the danger of relegating too far into the background that other and highly important factor to the incidence of disease, namely, the condition of medium or soil in which the organism would have to thrive in order to produce its ill-effects. He refers us to Dr. G. Newman's recent work on "Bacteriology and the Public Health," in which his views are largely corroborated, and from which he extracts the following relevant remark: "Which is the more important preventive method, to maintain the resistance of the individual, or to waylay the infecting organism, is a nice point we need not attempt to decide. Obviously, both objects should be kept in view." In the course of his address, the President stated that dogs are naturally immune to anthrax. On that point we do not agree with him, although we admit that they appear to have a high degree of resistance.

A statement of considerable interest was made by Dr. P. W. Bassett-Smith in his paper on the "Etiology of Mediterranean Fever." Infection is said to occur by various channels, chiefly: (1) By ingestion of infected unsterilised milk; (2) by direct inoculation by infected mosquitoes; (3) by direct inoculation through the skin, &c., by infected excreta and articles contaminated with these.

The first of those channels at once attracts the attention of veterinarians, since it implies the existence of a disease in the domestic animals of which very little appears to be known, at least at home. Apparently both cattle and goats are susceptible. Dr. Bassett-Smith says: "One of the most important discoveries of the present enquiry has been to show that 50 per cent. of goats in Malta are carriers of infection, that 10 per cent. pass the *Micrococcus melitensis* out in their milk, and that up till lately this infected milk has been freely used in the endemic districts. That milk can and does convey the disease when used unsterilised is now a fact beyond dispute. One of the most important examples of direct evidence proving that infected milk does

produce the fever in those who drink it is found in the outbreak of the disease in the s.s. *Joshua Nicholson*. This ship carried a number of goats from Malta; the crew made use of the milk from these animals, and many of them contracted the disease, those joining after the goats were landed being free." It would be interesting to know more of this disease and its symptoms, as manifested by affected cattle and goats.

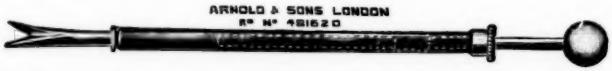
We hope that in a future edition the *Journal of the Royal Sanitary Institute* will publish the proceedings of the Veterinary Section, so that the views of the delegates to that Section may receive equal publicity with those of other Sections.

New Instruments and Appliances.

NEW CHISEL FOR EXTRACTING WOLF'S TEETH IN YOUNG HORSES.

SUGGESTED BY T. B. BINDLOSS, M.R.C.V.S., LONG SUTTON.

A COMMON operation the country practitioner is called upon to perform is the extraction of wolf's teeth in young horses, and I suppose that we all know what it is to have to adjust the chisel many times on account of the patient moving when we pick up the mallet. Messrs. Arnold and Sons, London, have made an instrument for me which is



practically a chisel and mallet in one, and which I have found very useful. It saves time and trouble, as the operation is completed before the patient becomes restive, and therefore is more effectual.

It is compact, being two instruments in one, and it gives the operation a more surgical tone. I find that my clients much prefer this to the blacksmith's tool, and it is therefore a source of additional income.

SPOON FORCEPS FOR ENUCLEATING WARTS, &c.

SUGGESTED BY W. ASCOTT, M.R.C.V.S., BIDEFORD.

THESE forceps will be found of great assistance in removing every kind of wart excrescence, including the large bunches so common on young cattle. The action of the forceps is such that there is little or

no hæmorrhage, and the growths being clearly removed, rarely recur. The makers are Messrs. Arnold and Sons, West Smithfield, London, who have carried out the idea to my entire satisfaction.

Correspondence.

VETERINARY EDUCATION AND THE EXAMINATIONS.

To the Editors of THE VETERINARY JOURNAL.

DEAR SIRS,—In my opinion it would be very difficult indeed to improve on the present method of testing the Veterinary Students' knowledge in the different professional examinations. Of course a teacher "if appointed an examiner," would be in a better position to form an estimate of what the student really knows about the subject which he professes, but then the disadvantages arising from the appointment of teachers as examiners (as pointed out by "M." in his article on this subject) would far outweigh this one solitary advantage. Consequently, I believe it would be a step in a backward direction.

Looking over the subjects which the student is required to pass during his professional course, there is one, Stable Management and Shoeing, which to my mind deserves the serious attention of the profession at large. At present it is one of the subjects prescribed in the second professional examination. Here we find it placed on equal footing with subjects like Anatomy, Physiology, &c., as proved by the fact that if the student does not obtain pass marks in this subject he is rejected, however brilliant he may be in the other subjects of the examination.

Now, when we come to consider what our aim as a profession is, it really seems absurd to find such importance attached to a subject which, in my opinion, is not worthy of a place in the prospectus of a scientific profession.

I need hardly mention what the examination in this subject at present consists of; but when one remembers that in Stable Management the following are not unlikely questions: What is the material used in lining a saddle? Describe the different forms of collars in driving harness; and in Shoeing, the student may be asked the uses of all the shoeing-smith's instruments; I say when such questions may, and often do, form part of the examination, one cannot help thinking that the subject has very little to do with the practice of medicine and surgery of the domesticated animals for which our diploma qualifies us, and is more in keeping with the knowledge required of a harness-maker and a shoeing-smith. Just imagine expecting a member of the medical profession to know whether a suit of clothes was a good fit or not, or if a pair of boots suited their purpose. Yet we do not consider it outside our course to know all about harness, and shoeing the normal foot.

Again, if such a subject is to be continued in our prospectus, why should it not embrace a knowledge of riding, which to my mind is of much more importance than the whole subject as it is required to be known under the existing rules? Does it not look far worse for the qualified man to fall off a horse in the process of trying him for his wind, than to be unable to make a halter?

What I would suggest is, first, that shoeing shall be taught in the final year, that it shall be included under surgery and shall be confined to surgical shoeing. Secondly, that stable management, as dis-

tinct from hygiene, shall be deleted from our curriculum syllabus, and that an examination in riding be passed before the student enters a Veterinary College.

Yours faithfully,
M.R.C.V.S.

MR. HARDING'S CASE OF DENTIGEROUS CYST.—A CORRECTION.

To the Editors of THE VETERINARY JOURNAL.

DEAR SIRS,—In your report of my case, "A Dentigerous Cyst," in the current issue of the JOURNAL, p. 499, there are two errors which I should like corrected, as the words make it read rather absurd.

The word "eye" in the ninth line of the second paragraph should be "ear." In the third paragraph, the words "of a filbert" at the beginning of the second line should be deleted, and a full stop inserted after "size."

Yours faithfully,
E. R. HARDING.

Veterinary Infirmary, Salisbury,
September 15, 1906.

Personal.

THE whole profession will note with pleasure that the name of Sir John McFadyean appeared in the list of those who received honour at the recent celebrations held in the University of Aberdeen. The degree conferred was that of Doctor of Laws (LL.D.).

MR. DUNCAN HUTCHEON, M.R.C.V.S., the head of the Cape Veterinary Department, has been appointed "Director of Agriculture" to the Government of Cape Colony; and Mr. W. Robertson, M.R.C.V.S., has been appointed Director of the Bacteriological Institute in Grahamstown, South Africa. It is in this latter Institute that most of the Mallein, tuberculin, anthrax and other vaccines against animal diseases are prepared for use in the Colony.

DR. SALMON, the late chief of the Bureau of Animal Industry, United States Department of Agriculture, has been appointed Director of the Veterinary School of the University of Monte Video, South America, and has taken up his duties in that position.

THE following gentlemen have been appointed as members of a Royal Commission "to enquire into and report upon the practice of subjecting live animals to experiments, whether by vivisection or otherwise, and also to enquire into the law relating to that practice and its administration, and to report whether any, and, if so, what changes are

desirable": Viscount Selby (Chairman); Colonel Lockwood, C.V.O.; Sir William Selby Church, Bart., M.D.; Sir John McFadyean, M.B., C.M., B.Sc., M.R.C.V.S.; Mr. Mackenzie Dalzell Chalmers (one of the Under Secretaries at the Home Office); Mr. Abel John Ram, K.C.; Mr. Walter Holbrook Gaskell, M.D.; Mr. James Tomkinson, and Mr. George Wilson, M.D.

REPORT OF THE VETERINARY DEPARTMENT OF THE PRUSSIAN ARMY FOR THE YEAR 1904.

THE Prussian army, "which includes the 13th Wurtemburg Army Corps," showed 32,918 sick out of an effective of 86,735 horses, or 38 per cent., during the year under report.

The largest number were in the Guards (3,193) and the 16th, 17th and 14th Army Corps; the most unhealthy stations being Lübben, Rosenberg, Gleiwitz, Bischweiler, Morehingen, Demmin and Dantzig.

The total loss was 1,865 (6 per cent. of sick and 2 per cent. of the effective), classed as—deaths, 1,153 (4 per cent.); destroyed, 358 (1 per cent.); lost 326 (1 per cent.).

There were 23 cases of glanders and 3 of charbon. Contagious pleuro-pneumonia was prevalent at Potsdam, Berlin, Metz and Schwedt, 1,675 cases, with 74 deaths (4·5 per cent.). The most common complications were tendinous synovitis, 50 cases; myocarditis, 18; ophthalmia, 15; gastric catarrh, 14; roaring, 9. Inhalations of oxygen and tallianine had no effect. Peat moss litter was used as a preventive, but had no effect on the outbreak. Vaccination was completely given up.

Influenza (typhoid fever) furnished 1,367 cases (4 per cent.) and 13 deaths (1 per cent.). Under this heading is included an outbreak of spinal paraplegia in a brigade of hussars, at Langfuhr, Dantzig, characterised by catarrh of the upper air passages and paraplegia; 486 horses were attacked and 7 died.

There were 20 cases of anasarca with 10 deaths, and out of 11 treated with collodial silver 8 died; 210 of strangles, with 6 deaths (160 of them were remounts); 2 of tuberculosis; 49 of contagious pustular stomatitis; and 65 of tetanus, with 45 deaths (71 per cent.).

Colic, 4,449 cases (13 per cent., or 5 per cent. of the effective), with 532 deaths (12 per cent.). The most frequent causes were: valvular of the small intestine, 86; torsion of the colon, 75; primary rupture of the stomach, 59; secondary, 27; ruptured colon, 26; parasitic aneurysm, 26; intestinal calculi, 25; gastro-enteritis, 22; ruptural diaphragm, 20; sand concretion, 18; diaphragmatic hernia, 17; ruptured mesentery, 7; ruptured cæcum, 7; ruptured rectum, 5.

Arecaline appeared to be the favourite drug used (883 cases), then aloes (805) and eserine (226).

Wounds, 4,339 cases.

Diseases of the feet, 3,100 cases, out of which 433 were laminitis, chiefly attributed to prolonged work at a quick pace on hard ground; canker, 30 cases, 13 cured. There were only 4 cases of quittor, which speaks well for the shoeing.

Fractures, 613, with 32 per cent. cured; fractured pastern, 106 cases; tibia, 91; pelvis, 58; cervical vertebræ, 57; and bones of the head, 48.

Sprain of the articulations, 2,314; of the fetlock, 1,315; coronet, 694; shoulder, 103; hip, 41; spavin, 279; and 2,904 sprains of tendons, viz., perforans and perforatus, 41 per cent.; suspensary ligament, 14; perforans, 13, perforatus, 8.

Tumours, 54, viz., 28 fibromata, 6 papillomata, 6 sarcomata, 4 botryomycomata, and 1 lipoma.

Professor Boll publishes some interesting notes concerning the Kazan Veterinary School, "the largest in Russia," in the *Revue Générale de Médecine Vétérinaire* for December 15, 1905, about which but little is known outside that country.

In 1904 the staff consisted of one director, four ordinary and two special professors, two fellows (*agrégés*, one prosector and four assistants, one farrier and five assistants, two laboratory assistants.

The director is also professor of sanitary police; his salary is £467 per annum; the professors, £300 to £429, the special professors, *i.e.*, those of pathological anatomy, histology, pharmacy and materia medica, £180; fellows, £120 to £190; and the prosector's, £120; the assistants, lodgings and £40 to £50 per annum. Certain professors, nine in number, who conduct certain special courses such as physics, chemistry, natural history, &c., from £60 to £90 per annum.

The total cost of the school was £12,000 per annum.

On January 1, 1904, the number of students was 582, viz.: 171 in the 1st, 171 in the 2nd, 123 in the 3rd, and 117 in the 4th year.

The subjects taught were much the same as in the French schools, with the addition of ecclesiastical history, German, physical geography, agriculture, mineralogy, and comparative anatomy.

There are fourteen honorary and thirteen corresponding members. The library contains 16,176 volumes, and there is a school of *feldschers*, *i.e.*, military assistant surgeons. In 1904, seventy-seven students graduated, fifteen with honours.

Translations and Extracts.

NOTES ON THE BACTERIA FOUND IN THE STOMACH AND INTESTINES OF THE OX.

BY ANKERSMIT.

Organisms possible of demonstration by cultivation are not very abundant in the stomach or intestines of the adult ox. Cultivations coincide with the results of microscopic examination, viz., if microbes are plentiful in microscopic preparations cultivations will be luxuriant, for there can be no doubt that the important ones can be cultivated.

The rumen seems to be the favourite locality, the abomasum

containing but few indeed, in some cases being sterile, and fewest of all being obtained from the duodenum. This is attributed rather to dilution by the gastric juice than to destruction by bactericidal action. A larger number are present in the cæcum and rectum, although not so many as in the rumen.

The micro-organisms present are obligatory and facultative. The first are those that multiply in the bowel and are found in it. The most common are the *Bacterium güntheri*, found in the rumen, and the *B. coli*, found in the small intestine.

Facultative organisms are those derived from the soil and the agents of putrefaction; they are usually cocci or sporules. All this class act on cellulose and hemi-cellulose; they are taken in with the food, and the intestine does not seem a favourable habitat for their development, although from the large number of soil bacteria found in the small intestines it is quite possible to suppose the reverse.

The author has made some researches into the nature of the part played by micro-organisms in intestinal changes. Kellner has shown that the formation of lactic acid in the rumen coincides with the presence of the characteristic lactic bacteria. Chemical research, however, differs on the point regarding transformation of cellulose, and it seems only reasonable to suppose that there are agents capable of altering cellulose that do not multiply in the intestine. It is also possible that it is altered by an enzyme, as has been already demonstrated by Hofmeister and Holdefleise.

In the calf there are large numbers of organisms, especially in the rectum, particularly the *B. güntheri* and others that form acids. In the small intestine there is almost invariably an anærobic organism without spores that has not yet been described, which the author terms *B. cloestridiiforme*.

(*Centralblatt für Bakteriologie*, Bd. xxxix., Heft 4, 5, and Bd. xl., Heft 1.)

NOTES ON RABIES.

BY PETROPAWLOWSKY.

THE author points out that Van Gehochten and Nelis' method of confirming the diagnosis of rabies is defective and that lesions of the ganglia are seen in several diseases.

He mentions *post mortems* made on thirteen dogs, seven of which died from rabies, one was destroyed, four died from typhus, and one of old age. In one that had all the specific symptoms of rabies, the muscular coat of the intestine was filled with hard white nodules that were easily enucleated, and which, on microscopic examination, were found to contain Balbianie's bodies.

Two dogs bitten by this animal were healthy two months after, and the author concludes that the suspected animal was not in reality rabid, but that the symptoms were provoked by Balbianie's bodies.

(*Archyw Wietierynarnyh Naouk.*)

A FORM OF PIROPLASMOSIS IN CATTLE.

BY DR. KATSCHYNSKI.

A SPORADIC outbreak of disease appeared, in 1904, in a herd of five hundred cattle, at Stawropel, in the Caucasus. Out of nine cows seven recovered, and two died on the sixth day.

The temperature was 40·8° to 41·5° C., respiration quick, pulse weak, appetite lost, mucous membranes yellow, and the patient very depressed. In some cases there were small hæmorrhagic points on the lips and gums, blood-containing fæces, and the urine a brown colour.

The mucous membrane of the stomach and intestines was greatly congested, spleen enlarged and soft, liver enlarged and softened, and ecchymoses on the pericardium.

In the blood from the spleen and kidneys numerous piroplasmata, both free and in the blood corpuscles, were found, as many as five being present in a single corpuscle. The skins of the cattle were covered with ticks.

The outbreak is remarkable, as the animals were stall-fed and kept permanently in stables. There was no hæmoglobin in the urine: and the death-rate, considering the number of parasites present, was exceedingly small.

The diversity of the clinical forms of piroplasmosis does not of itself constitute sufficient evidence to say, *ipso facto*, that they are different special forms of disease, and it is quite probable these different forms depend on the age of the parasites.

(*Archyw Wietierynarnyh Naouk.*)

THE SUPERVISION OF FOOD AND PUBLIC HYGIENE.

BY ENSCH.

THE supervision of food consists in the control of its production and distribution by the public authorities.

The supervision of simple alimentary substances, such as bread, milk and meat, is what chiefly engages the attention of the municipal authorities, more especially in England. The control of milk is specially important, not only from economic but hygienic reasons. The cow-house is, in reality, a factory, and cities use milk like water for the nourishment of the population. The deplorable conditions under which it is produced, "when a pure product is contaminated," does not seem ever to trouble the consumer who, beyond a vague assurance from the purveyor that it is all right, is in a state of ignorance about the cow, stable, conditions of transport, and means of preservation.

The matter is really a most important one, and Spreck has formulated certain propositions, viz., healthy cows, especially taking the strictest precautions against tuberculosis—isolation of the calves—elimination of breeds predisposed to tuberculosis—good sanitary conditions, especially with regard to food and ventilation—periodic veterinary inspection—discarding food likely to ferment—feed on hay, lucerne, rice, potatoes, or artichokes—sow only selected seeds so that

the danger of poisonous plants getting into the forage may be guarded against—there should be a plentiful supply of pure water—the cows should be milked before feeding, so that the dust from the hay does not contaminate the milk—the cows should be milked in places easily cleaned—the teats should be washed with warm water and dried with a clean towel—the milkers should keep their hands clean and wear a clean overall—a wire gauze should be fitted over the milk pail to prevent hairs passing through.

Only rigid inspection can insure these requisites being carried out, but the public are willing to pay more for guaranteed pure milk. Municipal cowsheds would be desirable, but in default central municipal milk depôts could be established; they would be analagous to municipal abattoirs for the purveying of meat with a guarantee of its purity by the public authorities.

(*Revue d'hygiene et de Police Sanitaire*, vol. xxvii.)

SOME EXPERIMENTS AS TO VON BEHRING'S ANTI-TUBERCULAR VACCINATION IN CATTLE.

BY ROSSIGNOL AND VALLÉE.

THE experiments were carried out on forty-one head of cattle between ten months and a year old, twenty-one were vaccinated, and twenty as control animals.

(1) *Harmlessness of Vaccination.*—The subjects were first tested with a double dose of tuberculin.

The vaccination was performed twice with ninety days' interval, viz., on December 11, 1904, and March 12, 1905, 20 milligrammes of dry bacillus were used, and the injection made into the jugular. The greatest care was taken to have a homogenous emulsion, and the injection was given very slowly.

There was no systematic disturbance worth speaking about. In two animals there was loss of appetite and in one slightly accelerated breathing, but only for a few hours.

All the subjects of the experiment were again tested with tuberculin sixty-two days after the first vaccination and, on March 12, the second was performed in the same manner and with the same results as the first.

Inoculation of tuberculous cattle with anti-tubercular vaccine gives the same results as hyperactive tuberculin. This has been noticed by Behring and confirmed by the authors at Alfort. Some subjects showed slight rise in temperature, and of them there were several that had not reacted the month previous.

The general condition of the animals was good and they retained their condition, although purposely kept on low diet.

Those that gave a doubtful reaction on February 12 were again tested on June 2, when one responded to it. This animal was again tested on August 6 and November 29, 1905, without result; it was slaughtered on December 6 and was found to be perfectly healthy.

The following point, therefore, would seem to have been definitely

established, viz., "that anti-tubercular vaccination is absolutely harmless with clean animals" is proved by the absence of clinical symptoms, non-reaction to tuberculin, and the absence of any lesions on *post-mortem* examination.

This is further proved by what was observed with six cows intravenously inoculated with virulent material and the *post-mortem* examination of thirteen controls. With the vaccinated animals there was no rise in the temperature, but with the controls there was a permanent rise, which would have been caused by the vaccine had they been tubercular. Again, the lungs of the vaccinated animals were perfectly healthy, showing that the vaccine had been completely absorbed without causing any lesion or giving rise to any ill results; and guinea-pigs that were inoculated with portions of the broncho-tracheal and mediastinal glands from vaccinated animals gave negative results.

(2) *Value of Vaccination.*—In order to determine the degree of resistence conferred by vaccination, a number of different ways of causing infection were tried. The most reliable was to place protected and control animals in close contact with others in which there were clinical symptoms. They were regularly tested so that the date of infection could be pretty accurately determined.

To be of any real value an experiment of this sort must be prolonged, as some control animals when exposed to infection will resist for a long time, even for months. In that undertaken in the present instance there was the weak point that there was difficulty in equalising the chances of becoming infected, although the position in which the animals stood was changed at frequent intervals; this change was also made in order to prevent control animals that had become affected themselves becoming fresh centres of contagion. Unfortunately, the means at the disposal of the authors were limited, and they could only obtain sixty animals, viz., twenty vaccinated, twenty controls and twenty suffering from disease during the year.

The details of the experiment were carried out on a plan suggested by Professor Behring. Six vaccinated and six control animals were inoculated in the jugular with a pure culture of tubercle bacilli obtained ten years previously by M. Nocard from the milk of a cow affected with this disease in the mammary gland, and which was virulent. Two mm. of a six weeks' culture of this material was enough to kill a two months old calf in thirty days, and in the experiment the author used double the quantity per head.

For subcutaneous inoculation a mixture of 10 cc. of the same bacilli and a gram each from five tuberculous glands from five different animals received from the Villette abattoir by Dr. Moreau was carefully beaten into an emulsion with 100 cc. of artificial serum, and 4 cc. of the preparation injected on the right side of the neck.

(*a*) *Cohabitation Test.*—From June 19 to December 1, 1905, the two vaccinated cows Nos. 30 and 31 and the controls Nos. 32 and 33 which had been previously tested with tuberculin were kept in contact with tuberculous animals in a small stable. The infected cows were, first, from June 16 to 25, a cow from the Villette market that died on the latter date, and which on *post-mortem* was found to be suffering from advanced disease of the lungs and pharynx. Second, two animals that had been inoculated by the jugular from July 3 to 22. These animals rapidly became emaciated and coughed loudly. They died on July 22,

and the lungs in both cows were extensively diseased. Third, a bull from July 17 to December 2. This animal was in very poor condition, but on *post-mortem* examination showed slight disease of the lungs. Fourth, a Dutch cow from October 27 to December 1. On *post-mortem* examination the animal showed extensive disease of both lungs and of the intestines.

The animals' places were changed daily, both vaccinated and controls, so as to allow of an equal exposure. On November 29, both the vaccinated and control animals were tested under tuberculin, the latter giving a marked positive reaction, while with the vaccinated it was *nil*. The vaccinated were sent to the Alfort College and again placed in close contact with tuberculous animals. The controls were destroyed. In both the channel of infection was through the digestive system and was undoubtedly from the contaminated animal No. 1, which was only in contact for ten days.

(*b*) *Subcutaneous Injection.*—On June 15, 1905, fourteen animals were inoculated subcutaneously on the right side of the neck with 4 cc. of the emulsion above described. The temperature was taken from the tenth to the thirtieth day; with the vaccinated it was normal, but with the controls there were frequent rises.

On the fifth day after inoculation there were swellings at the point of injection of all the subjects, but on the eighth day in the vaccinated there was only an œdematous patch and an abscess 3 to 10 cm. in diameter, whereas in the controls there was an enormous local abscess with swelling at the prescapular glands the size of an egg. On July 1 the local lesions had nearly disappeared in the vaccinated animals, but in the controls they remained stationary and even in some had increased, and the difference was most marked.

On September 29, one hundred and sixty-seven days after the inoculation, the whole were tested with tuberculin. Out of the seven vaccinated three gave a typical reaction. In one the temperature rose 0·9° C., the remaining three did not react. The whole were slaughtered on December 2. The prescapular, tracheo-bronchal and mediastinal glands were all carefully examined, and from those that appeared to be healthy and unaltered fragments were taken with which guinea-pigs were inoculated. The following table gives the results of the *post-mortem* examination and shows the great difference in the lesions between the vaccinated animals and controls :—

Nature of Lesions.	7 Vaccinated.	7 Controls.
Extensive lesions of prescapular glands...	1	7
Slight " " "	2	*nil*
Prescapular glands healthy in appearance but virulent	4	"
Pulmonary glands healthy in appearance but virulent	2	2
Pulmonary glands healthy in appearance and not virulent	4	*nil*
Lesions of lungs	*nil*	5

The conclusions are that in the controls the results of inoculation by the jugular are most serious, in the vaccinated they are benign, and in the animal that had least powers of resistance, No. 38, a "a Charolais," the bronchial glands were healthy and not virulent. In the controls the glands were greatly altered in five and highly virulent in two cases.

(*c*) *Intravenous Test.*—On June 15 six vaccinated and six control

animals were inoculated in the jugular with 4½ mm. of highly virulent bovine tuberculosis. The operation was well supported by the vaccinated, but the controls showed high fever between the thirteenth and fifteenth days with marked clinical symptoms. On December 2, when the whole were slaughtered, the vaccinated appeared to be in perfect health and condition, whereas the controls had rapidly fallen off, coughed badly, and the respirations were short and quickened from forty to sixty per minute, in fact, in all there were marked signs of acute pulmonary tuberculosis.

One control (No. 89, Flemish) died on the night of July 13, twenty-nine days after inoculation, and had extensive pulmonary lesions; a second (No. 92, Salers) died on July 19, thirty-four days after inoculation with the same lesions, and a third (No. 94, Salers) on July 3, seventeen days. In all three animals there was hypertrophy of the glands, the bronchial being the size of a man's fist, and the posterior that of a small beetroot.

The grave symptoms improved gradually in the three remaining controls, Nos. 90, 91 and 93, and they improved. They were destroyed on December 2, one hundred and sixty-eight days after inoculation. The *post-mortem* appearances were: No. 90, extensive lesions of both lungs with numerous grey caseous tubercles in the parenchyma and neighbouring glands, tubercles in the liver, and a large tubercular mass on the anterior surface of the diaphragm. No. 91, same as No. 90. No. 93, same as Nos. 90 and 91, except that the liver was normal.

This shows that intravenous inoculation is extremely virulent, and causes extensive lesions and death in 50 per cent. of non-vaccinated animals. The vaccinated were destroyed on December 2, one hundred and sixty-eight days after inoculation; the results of the *post-mortem* examination were: four were healthy and two had slight lesions of the pulmonary glands, whereas of the controls, three died on the twenty-ninth, thirty-fourth and thirty-seventh days, and three, which were destroyed, showed extensive pulmonary tuberculosis. The positive results obtained from the inoculation of guinea-pigs with healthy-looking pulmonary glands, from vaccinated animals, showed that the absorption of virulent bacilli is slow and often does not take place at all, also apparently healthy glands only contained a small number of bacilli, so that it was necessary to use large quantities to infect guinea-pigs, and even then they did not invariably contract the disease.

(3) *Duration of Immunity.* — In order to test the time immunity lasts, six vaccinated animals have been kept, and the authors propose to submit them to a series of tests at a future period.

Conclusions.—The authors particularly remark on the severity of the lesions induced in the control animals, also on a case that came under their notice showing the remarkable degree of resistance to virulent tuberculosis enjoyed by an animal that had recovered from a prior attack of the disease.

Amongst the animals purchased was a Breton heifer which reacted very slightly to the tuberculin test on December 5, 1904, and therefore was not used in the experiment. She was kept carefully isolated in a special stable and later on again tested, with negative results, when she was considered to be cured.

On June 15, 1905, she was inoculated with tubercle in the jugular in exactly the same way as the animals previously protected by von Behring's method. There was a sharp rise in temperature, but she remained in good health and condition, the same as those that had been protected. On December 17 she was again tested with tuberculin with a strong reaction. She was slaughtered on December 22, and the only lesions found were some calcified tubercles in the pulmonary and one of the prescapular glands, which were proved to be virulent with guinea-pigs. In two of the mesenteric glands there were three small calcareous bodies, like pearls, very hard and round. These, no doubt, were the remains of the primary lesion, which gave rise to the first reaction, but had since been cured.

This case seems to show that a primary mild attack of tuberculosis that had been cured confers on the subject a considerable but not an absolute degree of resistance to a future attack, the same as with animals protected by von Behring's process. The whole experiment permits the following conclusions being arrived at:—

(1) A primary mild attack of tuberculosis from which the animal has recovered confers a strong though not absolute degree of resistance to a second attack.

(2) von Behring's method of vaccination is harmless during the period of immunisation and for at least six weeks after.

(3) It confers immunity, certainly for several months, from infection by cohabitation with diseased subjects.

(4) Even against experimental infection with most highly virulent material it confers a high degree of resistance.

(5) The method used by von Behring is a true vaccine.

The bacilli are reabsorbed without leaving any trace, and those that have been noticed by Schweinitz, Schröder and others who have studied the subject are due to the use of insufficiently attenuated human bacilli.

Another point is that the emulsion must be perfect, and no animal should be vaccinated which shows the slightest signs of pulmonary disease.

The reaction to tuberculin which several vaccinated animals gave for some time cannot be looked upon as a proof that they were infected, it would appear to resemble that seen in animals that have been inoculated by bacilli attenuated by different methods.

It may be objected that all the vaccinated animals were not absolutely immune to the control inoculations, and that virulent bacilli were in certain cases found in the various glands. It must, however, be remembered that Koch's bacillus when dead is only slowly absorbed, also that immunity is relative, as seen in various other diseases, such as charbon, rouget, &c., and that absolute immunity has not yet been obtained, although it is a real one for all practical purposes.

These experiments have also shown that the dose used, viz., $4\frac{1}{2}$ mm., is ten times larger than that required to cause infection. The degree of immunity enjoyed which is early ascertained by experiment is such as the natural immunity of certain Algerian sheep against anthrax, and the artificial given by vaccination is, however, sufficient, and enables the animal to resist natural infection, and perhaps that given against tuberculosis by von Behring is of the same nature.

In spite of all the statistics that have been furnished, the authors,

after several years' experience, are doubtful of its practical value. One thing, however, they are certain about, is that immunity is only conferred after several weeks, and they consider that the strict isolation of new animals it is proposed to bring into the herd is absolutely essential before the operation is performed.

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BRIGHT'S DISEASE (CHRONIC MIXED NEPHRITIS) IN THE HORSE.

BY DR. GIUSEPPE MARCONE, PROFESSOR OF CLINICAL MEDICINE, VETERINARY SCHOOL, PISA UNIVERSITY.

On November 28, 1903, a six-year-old gelding was brought to the clinic, which by the owner's account had always worked well, but which for the past two months had gone off his feed, and had a swelling of the sheath that extended to the neighbouring parts when at rest, but disappeared when he was worked.

The swelling had gradually increased, extending forwards to the sternum, and backwards over the hind legs down to the hocks. With work the swelling decreased. The animal had always been well fed and cared for, and had never been ill.

The horse had been brought to Pisa at a trot from the owner's residence, 20 kilometres away. The coat was long, the skin somewhat hide-bound, sensation normal; mucous membranes pale pink; pulse strong but short, 49 per minute; respirations 20 per minute; flank very hollow; movements of the ribs visible; temperature, 39·2° C.

The prepuce was slightly infiltrated and pitted on pressure; the hind limbs were slightly œdematous.

Mouth dry and hot; movements of the lips, tongue and jaws normal; movements of the intestines plainly heard on auscultation; no tender spots. The droppings coated with mucus, foul-smelling, and contained some undigested grains of oats.

Pressure over the intercostal spaces was not painful; a dull zone was discovered on percussion of the thorax on the right side, over the lower third of the chest, but the rest of the chest was clear. On the left side the dull zone over the heart was greatly enlarged in every direction, extending backwards beyond the sixth rib and upwards, above the line of demarcation of the lower third of the chest. Percussion, however, caused no pain and did not provoke a cough. On auscultation of the right side of the chest there was an absence of the respiratory murmur at the lower part, but in the upper part it was normal; on the left the heart sounds were normal.

The heart's impulse could be felt with the hand. There was no jugular pulse, and the condition of the peripheral vessels of the head, neck, fore limbs and abdomen was normal.

There was increased sensibility over the loins. The urine was pale in colour, clear, slightly alkaline, and the specific gravity 1012. It contained a small quantity of albumin, chlorides, phosphates and mucus, but no blood, hæmoglobins, bile pigments, or glucose.

The animal was admitted to the hospital and given absolute rest. November 29: Temperature, morning 38·8°; evening 39° C.; hind

limbs somewhat filled. Sheath smaller, extending forward over the abdomen to the sternum and up the right side. Urine was frequently passed in small quantities, 6,000 cc. being collected in the twenty-four hours with Haubner's apparatus.

The urine was pale and clear, specific gravity, 1015, alkaline, smelt of hay, contained 0·75 per 1,000 albumin, and a small quantity of indican chlorides, phosphates and sulphates and urea, 18 per 1,000, but no bile pigments or sugar. A small quantity was centrifugal, and the sediment contained some white blood globules and a few red, some crystals of carbonate of lime, and a few hyaline casts.

If trotted for a minute, severe palpitation of the heart came on, with a metallic timbre and vibrating pulse, but the respirations were not greatly interfered with.

The patient remained in the infirmary till December 12. The quantity of urine voided during the twenty-four hours varied between 5 and 7 litres. The appetite was not good, and on an average the horse drank 8 litres of water daily. The œdema increased with rest, but almost completely disappeared with exercise.

The character of the urine did not vary greatly. The quantity of albumin ranged between 0·5 and 1 per 1,000, and about 200 cc. of centrifugal urine were examined daily, and found to contain some granular cylinders, a large number of granules, some hyaline cylinders, a few leucocytes and epithelial cells from the kidney, both round and granular, and some pavement cells from the urinary tubes.

The diagnosis was chronic mixed nephritis, interstitial being the most prevalent, hypertrophy of the heart, hydrothorax, and dropsy of the pericardium and abdomen. The prognosis was unfavourable, and as the animal could not work and was of no use he was destroyed.

Post Mortem.—There was œdema of the subcutaneous connective tissue in the sterno-abdominal region and of the hind limbs. The pleura, pericardium and abdomen contained a quantity of clear yellow-coloured fluid, the heart being large, rounded in shape, and the wall of the left ventricle hypertrophied, being 58 millimetres ($2\frac{5}{16}$ ins.) thick, and the ventricle itself representing $\frac{7}{8}$ of the entire organ. The right ventricle was also enlarged, the wall measured 18 millimetres ($\frac{11}{16}$ in.) in thickness. The muscle was firm and resistent and of a uniform pink colour; the valves were healthy. The lungs were of a pink colour, œdematous, and emphysematous at the apex. The digestive organs were normal.

The kidneys were enlarged, the surface smooth, capsule thickened, opaque and adherent, stripping off in places and lacerating the kidney, with portions of the cortex adhering. On section the corticular portion was greatly thickened with the Malpighian bodies showing out as dark red spots. The parenchyma under the capsule consisted of a layer of dirty white substance studded over with greyish points about 5 millimetres ($\frac{1}{4}$ in.) thick, and in the deepest part of the corticular portion were a number of greyish-brown lines about 3 millimetres ($\frac{1}{8}$ in.) wide, alternating with grey translucent ones of the same size. These lines were paler in colour in the cortex than the medulla, where they were largest, gradually disappearing at the periphery, The medullary portion was smaller and paler in colour than natural; the pelvis also was reduced in size.

Microscopic Appearances.—Haller's capsule was double the normal thickness, and under it in the corticular portion were a number of small patches of yellow connective tissue. The tubuli contorti were dilated, the epithelium indistinct, the outline ill-defined, the nuclei pale in colour, with a number of granules in the protoplasm. Where hardened in 70 per cent. alcohol and stained, the subcapsular epithelium were seen to be undergoing fatty degeneration, a large number of the tubes containing masses of purple, red, or orange granulations that blocked them up. The whole of the renal tubes were affected, but chiefly the smaller convoluted.

At certain points in the subcapsular zone there were small masses of leucocytes and newly formed connective tissue elements scattered about between the tubes, and many of them were blocked by an ill-defined albuminous substance that stained slightly with eosine. The vascular network over the glomerules was in many cases greatly diminished, so that an empty space existed. The capsular epithelium had partly desquamated, but the capsule was not thickened.

In the deeper part of the cortex at the commencement of the loops of Henle, the increase in the connective tissue was very marked, many of the capsules being completely surrounded, and almost all of them being atrophied. In many places the newly formed connective tissue was sufficient to reduce the parenchyma to a transparent fibrous mass, in which were the remains of Bowman's capsules and atrophied glomerules.

In the medullary portion the fibrillar connective tissue inserted itself between the tubes, separating them; it contained numerous lymphoid elements.

Both the tubuli contorti and Henle's loops were undergoing fatty degeneration.

Microscopical examination showed that there was fatty degeneration and new formation of the connective tissue, that the fatty degeneration was chiefly confined to the superficial and the connective tissue formation to the deeper portion. Both changes could be distinctly seen with the naked eye.

There are certain points in this case that are of interest if compared with the accepted ideas as regards the pathology and the symptoms of nephritis.

Cadeac states that chronic nephritis in the horse is a disease that is well known and common, but this statement is not confirmed; and it would appear that at all events in the horse nephritis is rare. According to the statistics of the German army, out of the total number of deaths in 1895 there were only five from primary nephritis, and from 1896 to 1900 from two to four per annum, or one per 10,000.

Kitt shows that inflammatory diseases of the kidneys take on such variable forms that it is impossible to classify them, and that so little being known as to their pathology, their differential diagnosis is a matter of uncertainty.

The earliest writers on nephritis are Von Vereyen, Hertwig, and Grosswendet. Von Vereyen's case was a horse with albuminuria and an enlarged kidney, but there was no œdema. At first the urine was clear and of a low specific gravity, but it afterwards became scanty of a high specific gravity, cloudy, a greenish-yellow colour,

and contained a large quantity of albumin. In Grosswendet's case there was œdema; the urine was blood-stained, of a high specific gravity, the kidneys were enlarged, the capsule thickened, and the outer portion tough and resistant.

Hable gives a description of several cases he saw in the districts of Grobning and Ihning of chronic nephritis, in which the urine was of a dark red colour, mixed with blood, œdema and dropsy. The kidneys were greatly enlarged, capsules adherent, and patches of a dark red or greyish-yellow over the surface.

Justig published a case of chronic diffused nephritis in a foal, in which the urine was passed frequently and in large quantities. The heart-beats were violent, the limbs swollen, urine yellow, specific gravity 1010, alkaline in reaction, albuminous, and contained indol, and the epithelial cells undergoing granular and fatty degeneration. The kidneys were enlarged, the cortex thickened, of a yellowish-grey colour, and the heart hypertrophied.

He reports a second case of interstitial nephritis in an old horse. Large quantities of urine were frequently found, but towards the end diminished in amount; the urine was pink or pale in colour, and the specific gravity was always below 1020. It contained albumin, renal epithelium, but no cylindrical casts. The heart-beats were very violent. The kidneys were a third their normal size, the capsule thickened, the corticular portion atrophied, the interstitial connective tissue hypertrophied (granular atrophy).

In a clinical note Fröhner describes the symptoms of diffused interstitial nephritis with polyuria, but not the lesions; and, on the contrary, Csokor gives an account of the lesions but not the symptoms. Dieckerhoff has a very brief note of two cases of chronic nephritis in the horse, complicated with amyloid degeneration of the kidneys, and in conjunction with Wagner he published another on chronic Bright's disease in another animal. About 9 litres of urine of a brownish-red colour, and specific gravity 1006 was passed daily. It contained blood albumin, epithelial cells, and hyaline cylinders. The kidneys were slightly enlarged, the corticular portion yellow, and the medullary a dirty greyish-yellow.

Ostermann found the lesions of mixed chronic nephritis in one kidney, the other being in a condition of granular atrophy or indurated sclerosis.

Friedberger relates a case of indurated nephritis, with œdema of the abdomen and limbs. The urine was normal in quantity, a reddish-brown, specific gravity 1028, and contained red and white blood cells, epithelium, and 1·7 per 1,000 albumin. The kidneys were indurated and the surface irregular, the capsule thickened, and the corticular layer hardened.

Tapka also mentions a case of interstitial nephritis in a foal. The urine was clear; there was œdema, and the patient got very thin.

Thomassen gives an interesting account of five cases of chronic nephritis that he saw in a period extending over several years. No. 1: The urine passed was small in quantity, yellow, thick, specific gravity 1050, and contained a large amount of albumin, fat hyaline cylinders, and granular fatty epithelial cells. The heart was slightly enlarged, the kidneys twice their normal size, somewhat resembling

Charcot's large white kidney. The cuticular layer was larger than normal, soft, yellow in colour, with white patches and lines on it, the epithelium undergoing fatty degeneration and increase in the amount of the interstitial connective tissue. No. 2: No œdema, great thirst; heart hypertrophied; large amount of urine passed; specific gravity 1005, traces of albumin and a few hyaline cylinders and epithelial cells; kidneys slightly atrophied; heart enlarged. Epithelium in canaliculus desquamating; granular fatty degeneration, especially at the periphery. Some glomerules contracted, and the interstitial connective tissue greatly increased. No. 3: Urine thick and of a high specific gravity, with albumin, granular hyaline cylinders and epithelial cells. Later on there was œdema of the limbs and sternum. The kidneys were indurated, surface irregular, capsule thickened and adherent, with the lining epithelium necrosed in places. The cellular tissue was hypertrophied. No. 4: Metastic nephritis with carious and purulent patches. No. 5: Great thirst; a large quantity of urine voided; no œdema. Later on the urine became scanty in quantity, dense, turbid, and of a greyish-yellow colour; specific gravity 1045; reaction acid, 2 per 1,000 albumin; granular fatty epithelial cells and granular casts. The kidneys were hypertrophied, and of a uniform dark red colour, with the capsule adherent. The left ventricle was slightly hypertrophied. Necrosis, desquamation and fatty degeneration of the lining epithelium, and many of Bowman's capsule thickened.

Markus describes a case of chronic nephritis in the horse with polyuria, œdema of the abdomen, sternum, and limbs. Urine acid, specific gravity 1024; 1·5 per 1,000 albumin. Some granular hyaline cylinders, epithelium, and a few red blood corpuscles. On examination there was found to be chronic parenchymatous and interstitial nephritis.

The above is a synopsis of the published cases of nephritis in the horse that the author has access to.

Putting aside those cases of granular kidney, *i.e.*, renal atrophy, sclerosis, cirrhosis, &c., all these authors mention increase in size of the affected organ.

In the author's case there was enlarged white kidney, the cuticular portion being pale and glistening: and this form of enlarged kidney, both white and red, appears to be the most uncommon in animals.

Authorities are divided as to the nature of the process by which these alterations are caused. Cornil, Ranvier and Lancereaux think that it is a degenerative process; Klebs and Johnson an inflammatory. According to Frerichs, when the acute stage passes into the chronic one there is hyperplasia of the connective tissue.

It would appear that in the earlier stages there is not only alteration in the epithelium but also in the connective tissue, but that at first the former is the more noticeable. Later on the latter asserts itself, especially when the disease develops slowly; but this theory is not borne out by the examination of chronic cases in which the parenchymatous lesion kills the patient, and not the newly formed connective tissue and degenerated epithelium. An instance of this nature is reported by Zimmermann in a case of chronic nephritis in the dog. It is possible that there may be chronic epithelial lesions only, but a combination of both epithelial and connective tissue is the most usual. Whether these two separate lesions develop simultaneously remains to be discussed. Death may take place when the formation

of the connective tissue arrives at the stage that is characteristic o ulcerated granular kidney, but this is not sufficient grounds to either accept or reject the theory that epithelial degeneration is not going on at the same time, and unfortunately the appearance of the kidney does not help to solve the problem; probably the case is not an old one, and there has not been sufficient time for the granular state to develop. If this is correct the probabilities are that the two pathological conditions develop simultaneously.

The relationship between the seat of the interstitial and epithelial alterations requires consideration.

Fatty degeneration and enlargement of the epithelium is seen in the entire subcapsular zone. The tubes are contact, and in certain places there is a collection of round cells, with traces of the increased connective tissue extending into the medullary substance. The earliest lesions are seen in Bowman's capsules, which become thicker as the glomeruli come nearer each other in the medullary tissue. *Per contra*, the epithelial degeneration, which is chiefly seen in the largest tubules, diminishes as the interstitial lesions increase. Both these processes start from opposite directions—the epithelial from the cortex towards the medulla, and the vascular in the reverse direction, and converging into each other.

This compound lesion is characterised on section of the organs by alternative white and grey lines that are visible to the naked eye, the paler ones being the tubes containing the degenerated epithelium, the darker ones the hypertrophied connective tissue in the cortex. This peculiar appearance is not seen in any other condition of the kidney, and can be looked upon as indicative of the disease on *post-mortem* examination.

The cardiac hypertrophy can be recognised during life without any difficulty.

Certain authorities consider that it is due to over-exertion of the heart from derangement of the renal circulation, others from trophic changes resulting from the nephritis. The author thinks that it is not due to any mechanical cause, as it is seen in cases of pure epithelial nephritis, and in a note by Zimmerman, on a dog that suffered from chronic parenchymatous nephritis, there was hypertrophy of the heart that could only be explained by the fact that there was nephritis. This appears to coincide with Bright's doctrine, according to which hypertrophy of the heart, following upon nephritis, is not due to diminution of the circulation of the blood in the kidney, but partly from derangement of the excretory functions. It has also been said that hypertrophy of the heart is only found in atrophy of the kidney, but the author has also seen it in hypertrophy. Veterinary authorities have classified nephritis into two classes, acute and chronic, and in this latter diffused mixed nephritis.

Cadeac, from a pathological view, classifies them as being due to large kidney (*i.e.*, parenchymatous nephritis) and small or atrophied kidney (*i.e.*, interstitial nephritis.)

Friedberger and Frohner divide chronic nephritis into two classes: first, parenchymatous; and second, indurated or interstitial; the symptoms of the first being those described by Cadeac in enlarged, and the second in atrophied kidney. Dieckerhoff divides it into parenchymatous and interstitial, atrophied or granular, mixed or chronic, and

Bright's disease as embolic. Putting on one side the embolic form, which can only be diagnosed by *post-mortem* examination, the others correspond to the two forms already mentioned. The same author gives but a vague description of mixed nephritis, which is only seen in advanced amyloid degeneration of the kidney.

Brusasco and Boschetti state that kidney lesions vary between those of parenchymatous and interstitial nephritis.

Oresta considers that in chronic nephritis the lesions are always of the mixed type, and that not only is the interstitial connective tissue implicated but also the renal epithelium.

Most authors draw a distinction between the parenchymatous and interstitial forms. In the parenchymatous the urine is scanty, of a high specific gravity, contains a large quantity of albumin, hyaline cylinders, epithelial cells, fat globules, and red blood corpuscles, œdemia of the depending portions of the body, and hypertrophy of the heart. In the interstitial form the urine is profuse, of a low specific gravity, and contains but a small quantity of albumin, hyaline cylinders or epithelium; no œdema or hypertrophy of the heart, but intense thirst.

Lustig's case is interesting, showing that both interstitial and parenchymatous nephritis may exist together, as there was marked œdema. Urine of a low specific gravity, containing but very little albumin and few epithelial cells, polyuria, bilateral impulse of the heart, and in fact all the symptoms of interstitial nephritis. In Markus' case there were the same, viz., œdema, polyuria, and urine of low specific gravity, small amount of albumin, granular cylinders, epithelial cells, leucocytes, or red blood corpuscles, and, on *post-mortem* examination, chronic parenchymatous and interstitial nephritis.

These cases would appear to prove that errors of diagnosis may take place, and that in the horse it is impossible to distinguish by clinical diagnosis between the two varieties. The recorded cases in veterinary literature are too few to be of much value.

Hypertrophy of the heart is not a constant complication in interstitial nephritis and atrophied kidney, according to Lustig, Markus, and Marcone; neither is œdema with the parenchymatous form. Fleischer records a case in a cow in which it was absent. Again, œdema and hypertrophied heart may be seen without atrophied kidney. The quantity, form, and condition of the epithelium in the urine is not always diagnostic, as is admitted by Jadew in a paper on the pathology of acute nephritis in the horse and dog. On the other hand, the low specific gravity of the urine, the polyuria, and small amount of albumin it contains are not indicative of chronic nephritis, as in the author's opinion the renal epithelium, particularly in the convoluted tubes, to a considerable extent undergoes fatty degeneration, although the quantity of urine voided is increased, the specific gravity lowered, and the amount of albumin lessened.

Brown-coloured and bloody urine containing a large quantity of albumin is not always indicative of epithelial lesions; in fact, Ostermann noted it in a horse in which in one kidney there was interstitial nephritis (granular kidney) and the other mixed (hypertrophied kidney), and, in fact, from the clinical symptoms, it is only possible to diagnose the chronic mixed variety, and this is the form generally seen in the horse.

These observations show that even in cases where there are both

epithelial and connective tissue lesions the symptoms are variable. and that what are looked upon as diagnostic symptoms of one condition, the other, such as polyuria and œdema, may be present at the same time. In fact, it is only possible to recognise that there is chronic mixed nephritis present without being able to specify the seat of the degeneration.

Veterinary pathologists, following on human medicine, have formulated a table of the different symptoms in the two forms of chronic nephritis, viz.:—

Chronic Interstitial Nephritis.	Chronic Parenchymatous Nephritis.
Increase in the average quantity of urine.	Decrease in the average quantity of urine.
Absence of œdema.	Subcutaneous œdema.
Urine clear, low specific gravity, contains a small quantity of urine.	Urine cloudy, high specific gravity, contains epithelium and blood, and a large quantity of albumin.
Heart hypertrophied, especially on the left side.	Heart not hypertrophied.

These distinctions, however, are not reliable, and are not borne out by either clinical or pathological observations, and the fact remains that all that can be diagnosed in the horse is mixed nephritis.

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(*Revue Générale de Médecine Vétérinaire.*)

AN interesting pamphlet has reached us from Caracas, Venezuela, by Drs. Rafael Rangel, Director of the Laboratory of the Vargas Hospital, G. Delgado Palacios, Professor of the Central University and Member of the Academy of Medicine, and Bernardino Mosquera, Member of the Academy of Medicine of Venezuela, on a disease of horses that is causing such great loss to breeders on the llanos of Venezuela.

This disease has been proved by the authors to be due to a trypanosoma, and to be identical with the mal de caderas of the Argentine and Paraguay.

The pamphlet is well got up and well printed, and contains some excellent plates of the trypanosoma in colours printed in Caracas. It is a revelation to us that medical science is so far advanced in this South American Republic, which is chiefly known in Europe from the notoriety of its bellicose President. The pamphlet, unfortunately, is in Spanish, a language which few English veterinary surgeons are acquainted with; but it is well worth the attention of those who can read it, and who take an interest in this important subject.

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Letters and Communications, &c.

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